THE HEATING AND VENTILATING MAGAZINE

1123 BROADWAY NEW YORK MAY, 1910

The Advance of Central Station Heating

A Rapidly Growing Industry Whose Interests are Being Furthered by the National District Heating Association

The business of furnishing heat for the physical comfort of man from a central station has become one of the large industries of this country. The reason it has not been advertised and exploited so much as the electrical industry has been that it was carried on in connection with some other business and considered as an avenue for the disposal of a by-product rather than a separate and distinct business in itself. Being considered in such light, there have not been published data and information concerning this business that the great importance of it deserves.

There are over 400 central station heating plants in the United States, the amount of capital invested running into the hundreds of millions and the financial returns aggregating a very large sum.

The questions met with in the construction and operation of these stations are many, and it has been found by those engaged in the business that the lack of reliable data and published experience has proved a great handicap in the construction and operation of such plants.

At the fifteenth annual convention of the Ohio Electric Light Association, held in Toledo, Ohio, in July, 1909, a number of central station men engaged in operating heating plants, as well as electrical, discussed the necessity of an organization by means of which data and information could be procured and distributed among those interested.

A temporary organization was effected and a committee appointed to prepare a constitution and by-laws which should be presented to a convention of the heating companies to be held some time in the fall of 1909. The committee did its work well, and the constitution of the organization, expressing the objects, covers very thoroughly the intention of the founders of the association. It is as follows:

"The objects of this association shall be to foster and promote the common interest of its members and to advance scientific and practical knowledge in all matters relating to hot water and steam heating, especially district central station heating; also to establish cordial and

beneficial relations with kindred associations and between manufacturers of heating equipment and appliances and installers of same and the members of this association."

The first convention, held in the city of Columbus, on November 10 and 11, 1909, was a surprise to those who organized the association. So great was the interest and so valuable were the papers and discussions that it was decided to publish the proceedings of the association in permanent form. At the close of the convention 28 central stations had enrolled as members of the association, and at the present time over 100 are upon the list.

The second annual convention will be held in the city of Toledo, Ohio, on June 1, 2 and 3, 1910. The meeting promises to be of great value, and the publication of the proceedings of 1910 will mark an advance step in the dissemination of information and data applying to this particular industry.

It will probably be the last time this association will meet in Ohio for some time to come, for, while Ohio men were instrumental in its organization, the association has grown so fast that other states will claim the future conventions for some time to come. Pittsburg and Chicago will both contest for the third convention, to be held in 1911. The association is destined to become one of the large national associations, and if it carries out its objects as stated in the constitution it will be a strong factor of practical benefit to heating men.

National District Heating Association

Programme of Second Annual Convention, Toledo, O., June 1-3, 1910

The National District Heating Association, which will hold its second annual convention in Toledo, O., June 1, 2 and 3, 1910, will have its headquarters at the Boody House. Following is the programme in full:

FIRST SESSION, WEDNESDAY, JUNE 1, 10 A. M.

President's Address, President A. C. Rogers, Toledo.

Welcome Address, Hon. Brand Whitlock, Mayor of Toledo.

Response, D. J. Hard, Cleveland.

Secretary's Report.

Appointment of Committees.

Announcements.

SECOND SESSION, WEDNESDAY, JUNE 1, 2 P. M.

Paper: "Description of a Modern Central Hot Water Heating Station," W. A. Wolls, Columbus Railway & Light Co., Columbus, O.

Paper: "Central Station Heating in Detroit," A. D. Spencer, Superintendent Meter Department, Central Heating Co., Detroit, Mich.

THIRD SESSION, THURSDAY, JUNE 2, 9:30 A. M.

Lecture: "Humidity, Its Necessity and Benefits," W. W. Brand, M.D., Health Officer, Toledo.

Paper: "Central Station Heating," by F. H. Stevens, Chicago.

FOURTH SESSION, THURSDAY, JUNE 2, 2 P. M.

Paper: "A Study on Insulation," Toledo Railway & Light Co., Toledo.

Paper: "A Study in Centralizing the Heat Supply," Prof. J. D. Hoffman, Purdue University, Lafayette, Ind.

Paper: "Advantages to Be Derived from the Combination of Heating and Power Business for the Central Station."

Discussion, opened by R. D. DeWolf, Rochester Railway & Light Co., Rochester, N. Y.

FIFTH SESSION, FRIDAY, JUNE 3, 9:30 A. M.

Reports of Committees.

Election of Officers.

Paper: "The Profitable Operation of a Central Station Without the Assistance of Electrical or Other Industries," Byron T. Gifford, Chicago.

Paper: "The Factors that Enter into the Cost of Generating and Distributing Steam for Heating," Charles R. Bishop, Lockport, N. Y.

SIXTH SESSION, FRIDAY, JUNE 3, 2 P. M.

Paper: "The Relative Efficiency and Resistance to Corrosion of Different Types of Radiators," Herbert Orr, Cleveland, O.

Lecture: "Coal Production and Consumption," Prof. R. H. Fernald, United States Geological Survey, Case School of Applied Science, Cleveland.

Central Power and Heating Plant for a Group of School Buildings

Manual Training School, Bath House, Municipal Gymnasium and High School, Brookline, Mass.

The central power and heating plant herewith described is of interest, as illustrating the successful combination of several isolated outfits into a single unit, and thus effecting a considerable saving, both in fuel and labor, as well as adding greatly to the convenience of operation.

Fig. 1 shows the general arrangement of the four buildings considered. At the time the matter of a central plant was suggested, three of these, the high school, bath house, and manual training school, were in operation, each being provided with its own boiler plant. In addition to this, the manual training school was equipped with a 50-k.w. generating set, which furnished power for driving fans and machine tools, and also for lighting purposes so far as its limited capacity would permit. Additional lighting in this building and the whole of that in the other two was done by means of gas and electricity purchased from a local company.

ESTIMATED SAVING OF TEN PER CENT. WITH CENTRAL PLANT

The matter of a central plant was taken under consideration at the time of the erection of the municipal gymnasium. The first idea which suggested itself was to enlarge one of the existing boiler plants, either in the bath house or manual training building, to furnish steam for heating and ventilating the gymnasium, and this led to the more elaborate arrangement of a central plant for both heating and lighting the four buildings.

It was assumed at the start that probably a saving of 10% could be made by burning the fuel under a single battery of boilers instead of in four separate furnaces. This is probably due to the fact that as the number of independent units is increased

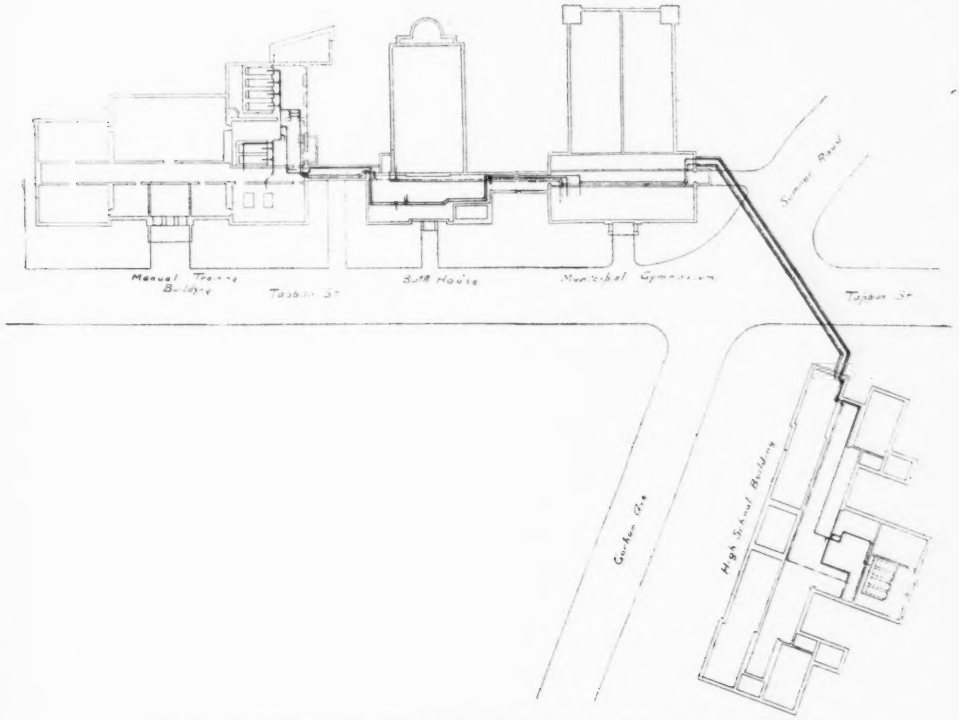
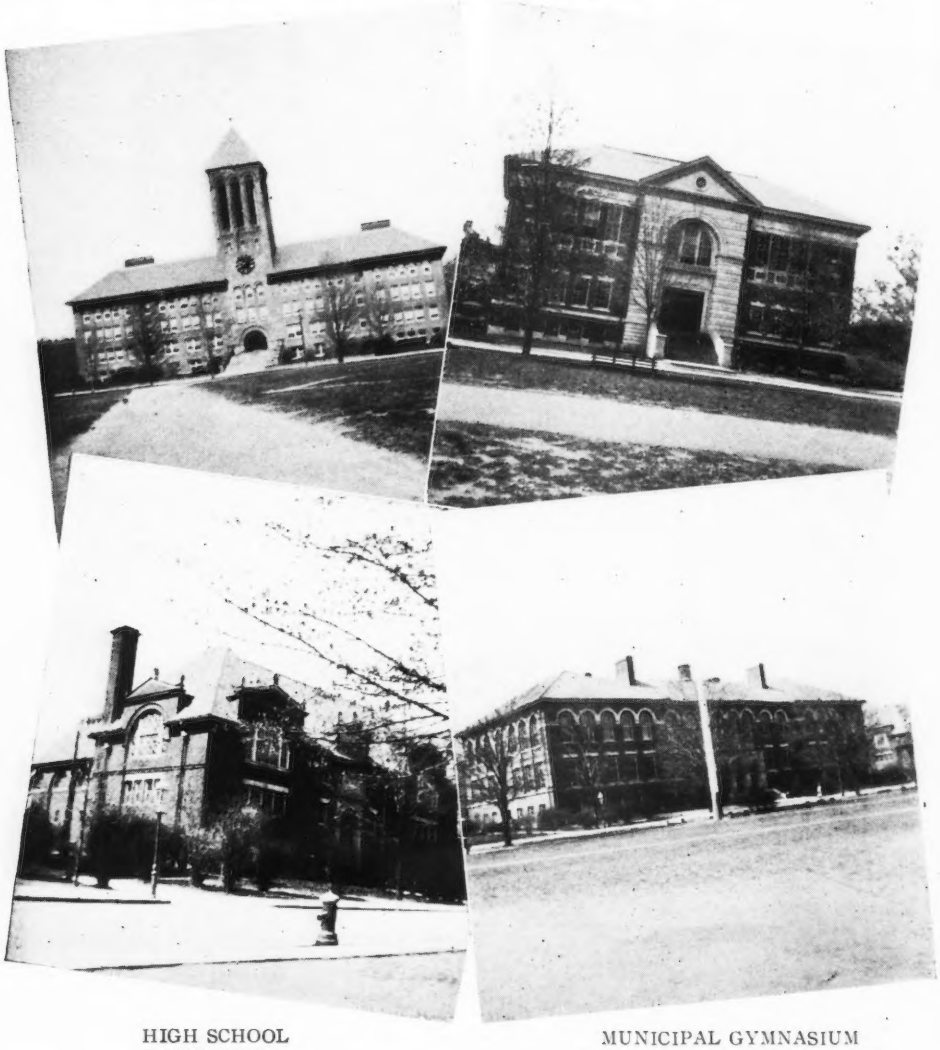


FIG. 1. BLOCK PLAN, BROOKLINE MANUAL TRAINING SCHOOL

to produce a given quantity of steam, the boilers become smaller and less efficient, due in part to their reduced size, but more especially to the less skillful firing and to the lessened care exercised in cleaning. Again, the number of attendants is necessarily increased out of proportion to the results obtained.

Where two or three plants of moderate size, equipped with a good type of boilers and receiving average care, are placed in a single battery, the figure, 10%, seems conservative, provided the runs of pipe to the different buildings are not so great as to make the heat loss by radiation excessive.

Another opportunity for saving, in the present case, came from the fact that the largest building in the group, the high school, was burning anthracite coal, while it was possible to design the central plant for burning a cheaper grade of fuel.



HIGH SCHOOL
BATH HOUSE

MUNICIPAL GYMNASIUM
MANUAL TRAINING SCHOOL

BUILDINGS OF THE BROOKLINE MANUAL TRAINING SCHOOL

The installation of a private lighting plant seemed desirable because, for a considerable portion of the year, the exhaust steam could be used in the general low pressure heating system of the manual training school and the two adjacent buildings. Another feature in favor of a central plant was the fact that the load on the boilers could be more evenly distributed.

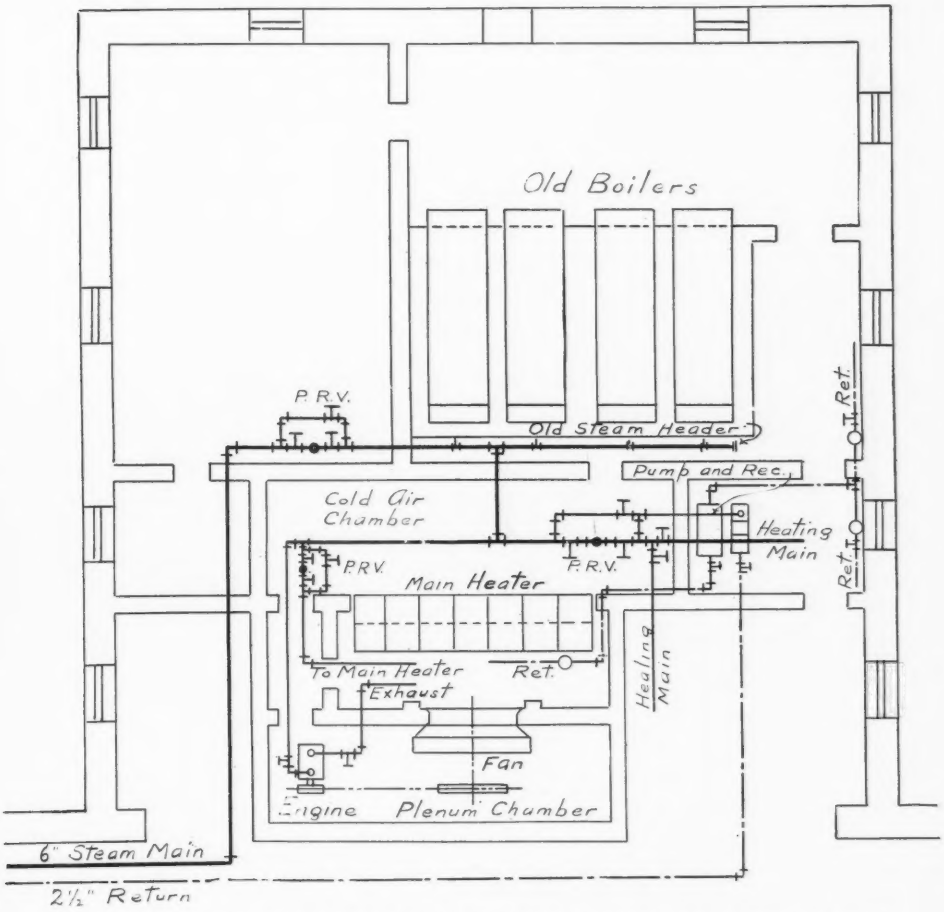


FIG. 2. PLAN SHOWING PIPE MAINS AND VENTILATING APPARATUS IN HIGH SCHOOL BUILDING

The maximum loads in the two school buildings came before 1:30 p. m., after which time fans and motors were shut down and only sufficient steam used to warm the buildings to a moderate temperature without ventilation. During the evening, power was required again for lighting, and three nights a week an extra boiler was brought into use in the bath house after 10 o'clock for heating water for refilling the tank.

By the use of a central plant, furnishing steam for heating and ventilation, lighting and hot water heating, the work could be pretty well distributed throughout the 24 hours, or so nearly so that it would only be necessary to check or bank the fires lightly, without cooling down a boiler as was necessary with the arrangement at that time.

The object of the present article is to present the general scheme adopted, rather than to go into details of construction, and for this reason the plans are diagrammatic to some extent instead of showing the exact location of pipe mains and apparatus in all cases.

High School

This building is the largest of the group. It contained a battery of four horizontal boilers rated at 45 h.p. each. These furnished steam for warming and ventilation, the two systems being to a certain extent independent. Strictly speaking, the building is heated by direct radiation in the form of pipe coils and radiators. These are supplied with steam at a low pressure of 5 or 6 lbs., and the condensation trapped to a vented receiver, from

which it was originally pumped back to the boilers.

Ventilation is furnished by an 8½-ft. cone fan driven by a 7½ x 7½-in. Westinghouse engine, and the air is warmed by a special heating coil made up of 1-in. pipe and divided into seven sections, three of which are so valved that they may be used for condensing the exhaust seam from the fan engine. Steam at about 10 lbs. pressure is used on the line sections of the main heater, and the condensation is trapped to the receiving tank already mentioned. The condensation from the exhaust sections is trapped to the sewer.

In the new arrangement (Fig. 2) a tunnel was constructed between the gymnasium and the high school, and steam at 85 lbs. pressure brought over through a 6-in. main. This pressure is reduced to 30 lbs. and connection made with the old steam header at the rear of the boilers, as shown. All returns are trapped into the receiver near the rear of the boilers at the right, and are pumped back to the new boiler room in the manual training building.

Municipal Gymnasium

This building is heated by direct radiation and ventilated by mechanical means (Fig. 3). The heater is of the mitre form, being approximately 6 x 12 ft. over all and 16 pipes deep. This is divided into eight separately valved sections, four at each end, as shown. The fan is of the enclosed type with horizontal discharge, with 7-ft. blast wheel, and is driven by a 5-h.p. direct-connected electric motor using a direct current at 220 volts. The motor is of the eight-pole type, and is bolted directly to the fan casing.

Discharge ventilation is accomplished by means of two direct-connected 5-ft. disk fans at the top of a central ventilating shaft, which connects with the more important rooms.

Referring again to Fig. 3, we see the 6-in. high-pressure main leading to the high school, a branch being taken off for supplying the hot water tank through a reducing valve at a pressure of about 6 lbs. A cross-connection, not shown in the drawing, is also made with the main heater, for use when desired. The 8-in. low-pressure heating main from the main boiler room supplies steam for heating and ventilating this building under normal conditions. The returns from the direct and indirect heating systems and from the hot water boiler are first discharged into a receiving tank, from which they are pumped into the 3-in. main return, and thus carried back to the receiving tank in the boiler room. The exhaust from the pump is carried to the bath house, where it has an outboard discharge. There is also a cross-connection into the heating system, not shown on the plans. The hot water tank shown in the corner of the fan room is 3½ ft. in diameter by 8 ft. in height, and is provided with an internal heating coil. It supplies warm water for the shower baths and for general lavatory purposes in this building.

Bath House

This building is heated by direct radiation, and is without mechanical ventilation. In addition to the various offices, shower baths and dressing rooms, it contains a main swimming pool having a capacity of 72,000 gals., and also one of small size, exclusively for children. During the summer time the tanks are emptied and refilled every night, while in the winter three times a week is found to be sufficient. The water in the main tank is heated to a temperature of 76° F., and that in the smaller one to 86° F. When once heated, the water is kept warm by means of steam coils in the closed space surrounding the tank, as indicated in Fig. 4. The water is heated by a steam jet at about 30 lbs. pressure, blown into the water supply pipe by means of an injector. The size of the water main is 5 in., the steam supply 2½ in., and it requires about 2½ hrs. to fill the tank. A laundry for doing the work of the municipal buildings of the town, including the schools, is located in the basement.

Originally this building contained two 70-h.p. boilers, one of which was

sufficient for heating purposes, while both were required for heating the tank. These were removed when the plant was changed over, and the space utilized for the laundry already mentioned. Fig. 4 shows the general arrangement of the pipe mains in the basement of this building. A 10-in. low-pressure and a 7-in. high-pressure main are brought into the building from the boiler room, as shown. A 5-in. low-pressure branch is taken off for heating purposes, and the pipe continues as an 8-in. main to the gymnasium. Two 3-in. branches are taken from the high-pressure main, one for the laundry and one through a pressure reducing valve for water-heating purposes. Water for shower baths and the laundry is heated in a tank or boiler 3½ ft. by 9 ft. by means of an internal steam coil. This tank is shown at the right of the laundry. All condensation in this building is trapped to a receiver and discharged into the main 4-in. return by means of a pump.

Manual Training Building

This building contains the main steam and lighting plant for the entire system, in the basement. The building

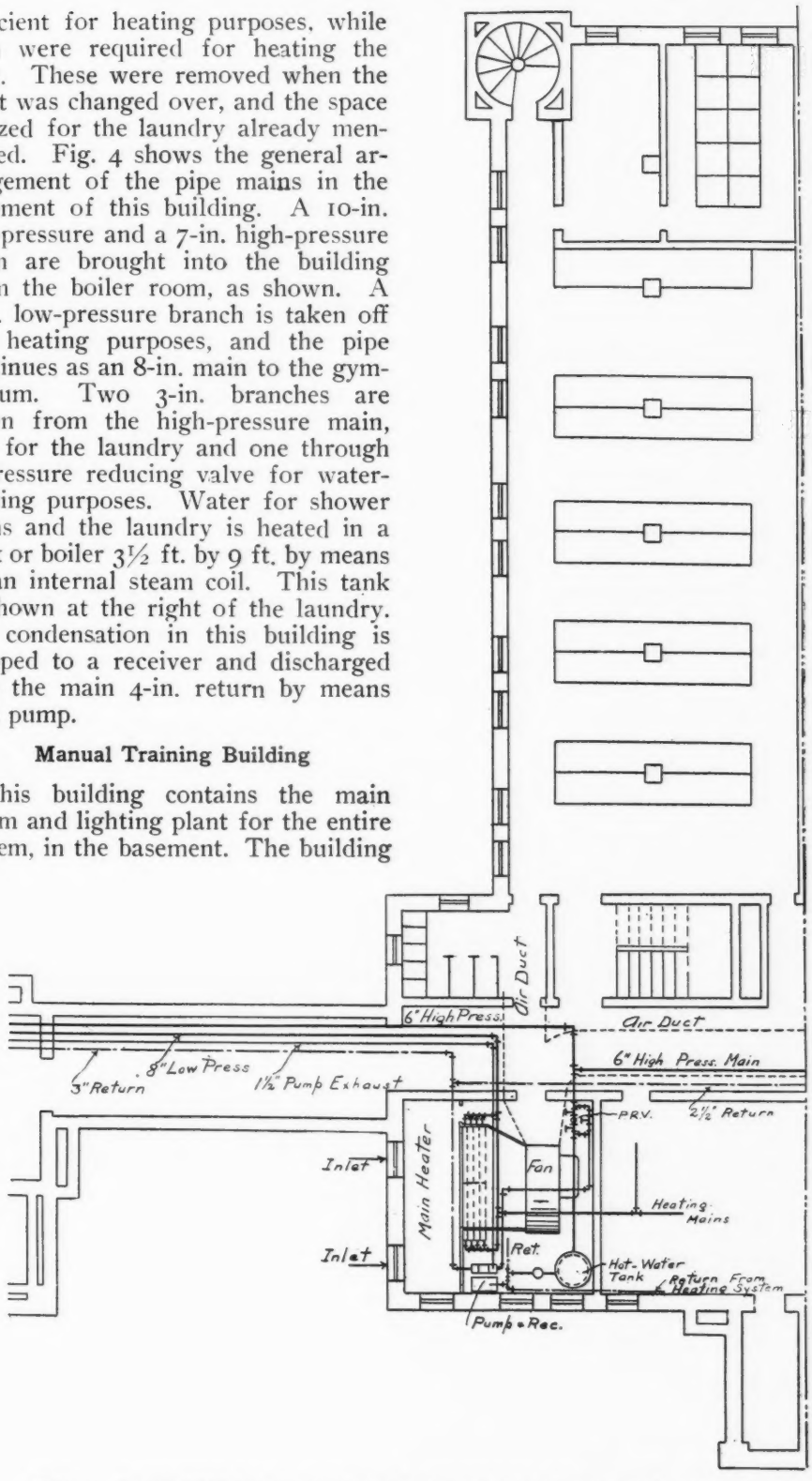


FIG. 3. BASEMENT PLAN (ONE-HALF) MUNICIPAL GYMNASIUM, SHOWING VENTILATING APPARATUS AND PIPE MAINS

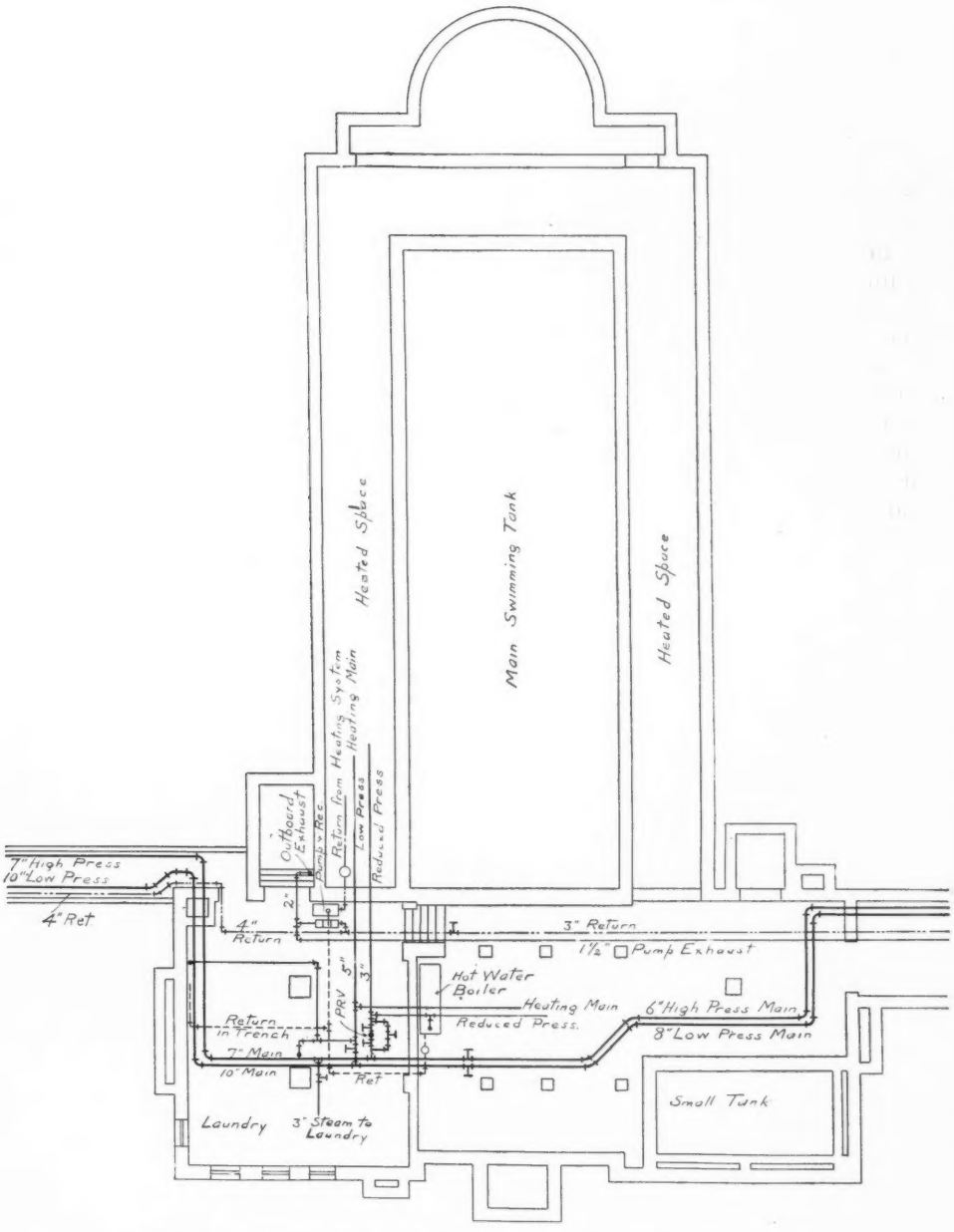


FIG. 4. BASEMENT PLAN OF BATH HOUSE SHOWING PIPE MAINS

is heated by direct steam, and ventilated by means of a Sturtevant outfit consisting of a 5 x 6-ft. pipe heater, 10 rows deep, enclosed in a steel plate casing and a 4½-ft. centrifugal fan with a vertical up discharge. The heater utilizes the exhaust steam from the smaller engine, although it is provided with a cross-connection for live steam supply when this engine is not in use. The fan is driven by a 7½-h.p. Holtzer-Cabot belted motor. In addition to the ventilating fan, there are three other fans for various purposes. The original steam equipment in this building consisted of two 100-h.p. horizontal tubular boilers, receiver and return pumps, and a 50-k.w. generating set, consisting of a 12-in. x 11-in. Westinghouse standard engine, running at 300 r.p.m., and a direct-con-

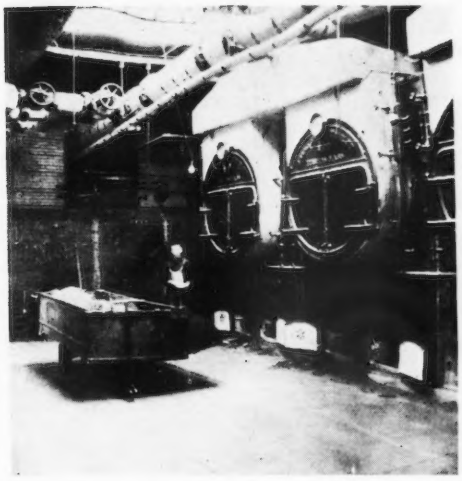


FIG. 5. CORNER OF NEW BOILER ROOM, MANUAL TRAINING BUILDING

nected dynamo of the same make, generating a direct current of 220 volts. In the new arrangement the boilers and generating set were kept as part of the final equipment, being supplemented by four additional boilers, a new engine and generator, feed-water heater, and receiver and return pumps of increased size. The new boilers are each 66 in. in diameter by 18 ft. 4 in. in length, and contain 110 3-in. tubes each 17 ft. long.

In the present case a natural draft is found sufficient for ordinary conditions with moderate fires, forced blast being used only where it is desired to push the boilers at special times. Pea coal is burned at the present time with good results.

A corner of the new boiler room, showing two of the four boilers, is illustrated in Fig. 5. This battery is used during the winter season, when the work is heaviest, while the old boilers, the fronts of which are shown in Fig. 6, are used during the summer, the change being made about the first week in May. Each boiler is provided with a Crosby pressure gauge, with 8½-in. dial and a 4-in. pop safety valve of the Ashton make. The connection from each boiler to the blow-off tank is 2 in. and fitted with a 2-in. Ashton blow-off cock and a 2-in. brass gate valve. In addition to the usual blow-off or drain from the rear of the boilers, they are provided with 1½-in. surface blow pipes, the same being connected with the main blow-off pipe at the rear of the boilers. A 2-in. vapor pipe is carried from the top of the blow-off tank and connected with the main 8-in. exhaust head, and serving also as a drain for the same.

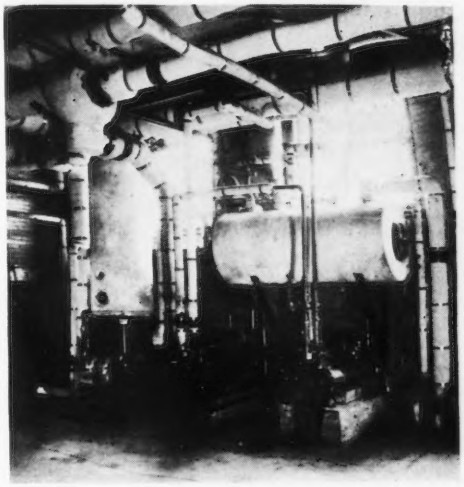


FIG. 7. BOILER FEED PUMPS, TANK AND FEED WATER HEATER IN MANUAL TRAINING BUILDING

FIG. 6. OLD BOILERS IN MANUAL TRAINING BUILDING

All of the condensation from the various buildings, except in the manual training school, is pumped into a main receiving tank located in the old boiler room, as shown in Fig. 6. The returns from the latter building are trapped directly into the same tank.

This tank or receiver is 30 in. in diameter by 72 in. in length.

Connecting with the tank and with the boilers are two Knowles 7½ x 5 x 6-in. duplex boiler feed pumps. The general arrangement of the pumps and tank, together with the feed-water heater, is shown in Fig. 7. The suction from return tank to pumps is of 3-in. brass, and the discharge from pumps is of the same material, 2½ in. in diameter. This is extended from the outlet pumps to the feed-water heater, making connections with the inlet and outlet of same and is also provided with a full-sized by-pass. Branches are carried to each battery of boilers, as shown on the plan, and each boiler is supplied through a 1½-in. connection furnished with gate and check valves.

The general method of making the feed connections is best shown in Fig. 8, which represents a cross section through the boiler and engine rooms.

The feed-water heater shown in Figs. 6 and 7 is of Jacobs make, rated at 400 h.p. It is connected into both the steam and water systems on a by-pass, so that it may be cut out for repairs or cleaning when desired without disturbing the operation of the system.

As the floor of the boiler room is below the grade of the sewer, it was necessary to provide a sump well and means for draining it.

The generating plant consists of two units, one of 50 k.w. capacity and the other of 75 k.w. capacity. The smaller unit belonged to the original plant. Fig. 9 illustrates the new generating set, and also shows the switchboard beyond. The engine is 14 x 12 in., simple, non-condensing, of the American-Ball make, running at 270 r.p.m. This is direct-connected to a Westinghouse dynamo as shown. Both

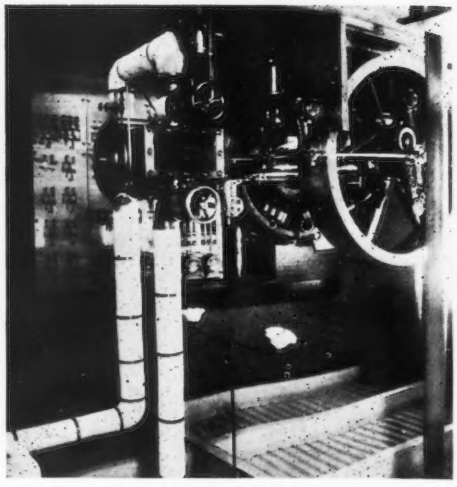


FIG. 9 NEW GENERATING SET IN MANUAL TRAINING BUILDING

machines generate a direct current of 220 volts, and may be run either separately or in parallel. The current is used partly for lighting the various buildings and partly for driving the 14 motors connected with fans and machine tools. The exhaust steam from the Westinghouse engine is used in the main heater in connection with the fan for the manual training building, while that from the Ball engine goes into the low-pressure heating system.

The general arrangement of the heavy steam and exhaust piping is shown in Fig. 6. The six boilers first discharge their steam into a common drum or header, from which supply pipes lead to the engines. A 7-in. main is also taken from this header, leading to the bath house, and from there as a 6-in. main to the high school building. An 8-in. connection with the 12-in. header in front of the new boilers delivers steam through two duplicate pressure reducing valves into a 10-in. low-pressure main leading to the bath house and gymnasium. The

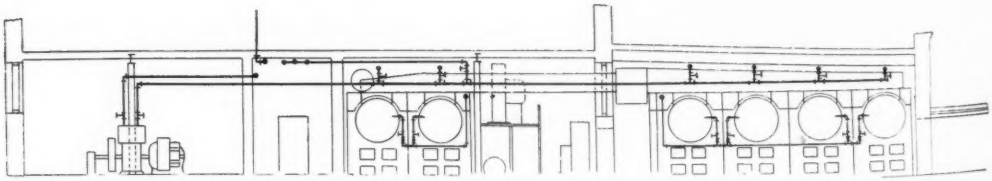


FIG. 8. CROSS SECTION THROUGH ENGINE AND BOILER ROOMS, MANUAL TRAINING BUILDING

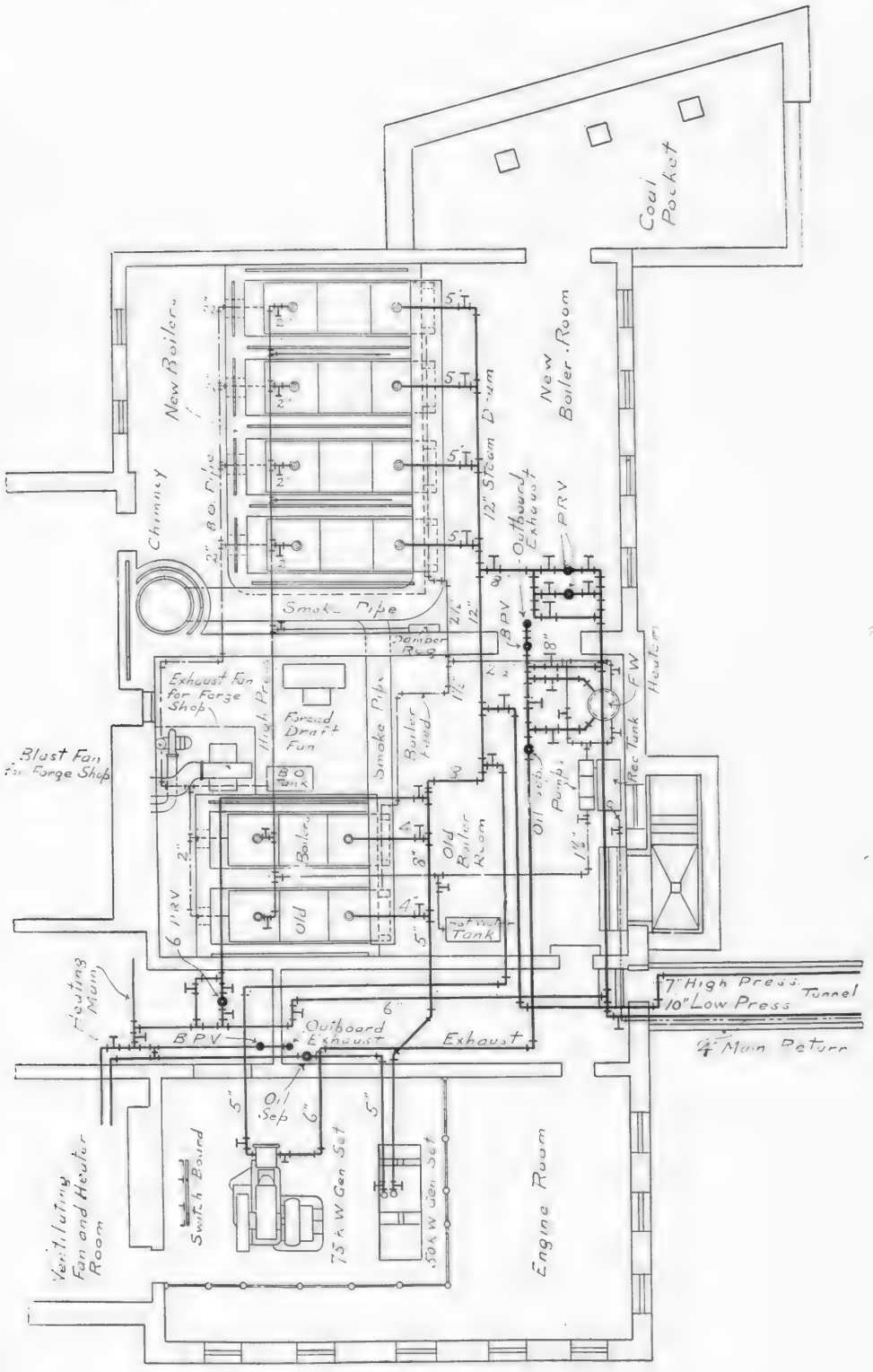


FIG. 10. PLAN OF BOILER AND ENGINE ROOMS IN BASEMENT OF MANUAL TRAINING BUILDING

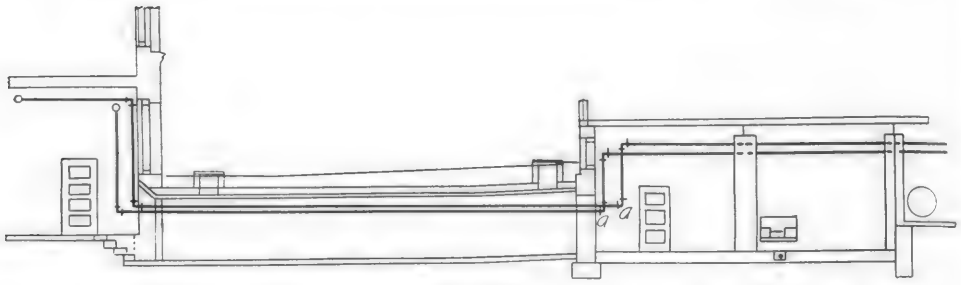


FIG. 11. SECTION THROUGH TUNNEL BETWEEN MANUAL TRAINING SCHOOL AND BATH HOUSE

exhaust from the Ball engine also passes into this main through a Cochrane oil separator, although it is also provided with a by-pass through the feed-water heater and an outboard connection through a back-pressure valve.

TUNNEL WORK

The method of carrying the high and low pressure mains through the tunnel between the manual training building and the bath house is shown in Fig. 11. All low points throughout the system, like those at AA in Fig. 11, are drained through traps into the return system. An auxiliary high-pressure line is taken off from the rear nozzles of the boilers for supplying the damper regulator, hot-water tank, feed pumps, steam tube cleaners, and ejector in sump well.

All fittings between the new boilers and the 12-in. drum are flanged and in extra heavy wrought iron. In making up this work the ends of the pipe were screwed through beyond the face of the flange and faced off in a lathe. Other high-pressure piping, including that in the tunnel, is made up with screwed fittings good for 100 lbs. pressure, except for flanged connections once in 50 ft. for facilitating the removal of sections in case of repairs.

The exhaust piping is of standard weight wrought iron with screwed fittings.

Special care is used to prevent damage due to expansion and contraction by the use of anchors and expansion joints properly placed. The anchors used are in the form of heavy wrought iron clamps bolted to pipes or fittings and anchors bolted to the building walls and ceilings. Expansion joints are of Walworth make, with iron bodies and brass sleeve and packing glands. All flanges on high-pressure valves and fittings are packed with corrugated copper gaskets between two thin sheets of vulcanized packing. Other flanged joints are made up with Rainbow packing.

The architect in charge of the entire work was F. Joseph Untersee; consulting engineer, Chas. L. Hubbard; designing and supervising engineers, Buerkel & Co.; contractors, Isaac Coffin Co., all of Boston.

Massachusetts Factory Commission Named

Governor Draper of Massachusetts has appointed a factory commission to investigate the general subject of the inspection of factories, workshops, mercantile establishments and other buildings. This commission was created by a recent act of the general court. The commission is to study the present system of factory inspection as it is administered by the district police, the state board of health and the local authorities, to determine if there is any duplication of work or absence of proper inspection; to consider the need of extending such inspection and to recommend such changes in the law as shall seem necessary to co-ordinate the work and to secure greater efficiency and economy in such inspection.

The governor has named as members of this commission Albert B. Apsey, Cambridge, Chairman; Dr. Herbert C. Emerson, Springfield; John Golden, Fall River; Emily G. Balch, Wellesley, and James W. H. Myrick, Boston.

Mr. Myrick, one of the appointees, is president of the Autoforce Ventilating Co., of Boston, manufacturer of a well-known patented ventilator. He is a member of The American Society of Heating and Ventilating Engineers and is the Massachusetts representative of the publicity committee of that society.

Cleanliness in Ventilation

By Ralph C. Taggart*

There is one point in the design of ventilating apparatus, which is too often overlooked. This is the cleanliness of the apparatus. Where air-cleaning washers or filters are used they will require attention. Many of these appliances, if not properly looked after, become themselves most foul. Whether or not the apparatus has an air washer or an air filter, it should itself be arranged so that all air passages can be kept clean.

Horizontal air flues and ducts which are not themselves cleaned out become in many cases real dirt collectors. How often have we looked at the basement plans of a ventilating equipment in which the flues seemed most to resemble the intertwinings of many serpents. These flues often cannot be cleaned and, even where clean-out doors are provided, the ducts usually are not cleaned out on account of the labor involved.

How many owners and occupants of buildings know what they have in their basements? I can hardly blame a society lady of New York City for her fixed determination not to have any air from the basement brought to the rooms of her new house. She did not mean basement air, but air from out-of-doors carried through the basement. At first her point of view may seem foolish, and probably she had the idea that more or less of the air must come from the basement. But where we know the condition of the insides of the basement flues and ducts of many heating plants, it is a question whether we might not at times prefer air taken directly from the basement.

We assume so readily that the insides of the flues and ducts of the ventilating apparatus must be clean. We have a right to assume that smooth vertical flues will not retain much dust, but in the case of horizontal ducts and flues the condition may be very different.

*Consulting Professor of Heating and Ventilation, Polytechnic Institute, Brooklyn, N. Y.

Where air is brought from out-of-doors and heated by indirect heaters, the air is usually carried to the heaters through ducts or flues. It is much better to bring the air directly into chambers or rooms in which the indirect heaters are located. These rooms will then become cold air settling chambers. This arrangement leaves the bottoms of the indirect heaters entirely open, so that all that is required, in the way of hoods or casing, is a hood directly above the indirect heater, with a short connection to the vertical flue. The indirect heater should, of course, be placed near the vertical flue, so that the connection from the hood will be a minimum. A large door into the hood should be provided and placed so as to be readily opened. It is essential to have a cold air, as well as a warm air, connection to each vertical air supply flue when the rooms require ventilation. This cold air connection allows a mixture of cold and warm air to pass to the rooms in moderate weather, when a mixture is required, in order to lessen the temperature without lessening the quantity of the air.

The bottom inlet of the vertical air supply flue is the place to which dirt in the vertical flue will fall and, as this inlet may be left entirely open, the dirt is readily seen and may be easily cleaned out. These cold air chambers should be rooms from which dirt may be easily removed. They should be finished smoothly on the inside. They should not be rough unfinished spaces, from which the complete removal of dust by sweeping is practically impossible.

In the case of vent flues the lower outlet may be an open enameled outlet box. Any dust in a vertical vent flue will fall to this open vent box, when it can be easily seen and readily removed. When fans are used it is essential to arrange all horizontal air passages so that they can be cleaned out with the greatest ease

There is a method, developed by Mr. William J. Baldwin, of running tempered air ducts in the basements of buildings, which has many advantages. The general scheme is to make the air duct a passage-way through which a man can walk, and which can be easily kept clean. The intention is to run only vertical flues from this duct. In some buildings this duct has been placed next to the outside basement wall. If the basements are of fair height, the ducts may be carried up only to the bottoms of the basement windows, so as not to interfere with the general lighting of the basement. It is, of course, possible to arrange the ducts so that light from the basement windows will pass to the basement proper by glazing the sides of the ducts. In some cases it may be desirable to place these air passages away from the outside building walls and parallel to interior walls. The walls on the upper floors, directly above these basement walls, may then contain the vertical flues and become what are called the "breathing walls." In many buildings these breathing walls can best be located at the sides of corridors.

At those points within the basement, where it is necessary to arrange passage-ways, through what would naturally be the duct space, the duct itself may be carried above or, if absolutely necessary, below the doorways. In all cases these passages above or below doors should be made large, so as to be easily accessible and readily cleaned out.

Ducts made in the manner described should not be made of galvanized iron. They can be made of plastered partitions with concrete floors, similar to interior corridors, or they may be made with a smooth enamel brick or tile lining, which can, if desired, be washed out with a hose or otherwise easily cleaned.

The flues to the various rooms will then become only vertical air passages, from which dust and dirt must fall to the air passages in the basement, where it can be easily removed. In a building of permanent construction it may be desirable to line the vertical flues with a smooth enamel lining, and the outlets in the various rooms may even at times be formed with enamel brick with rounded corners without the use of registers.

Ventilation of the Hudson River Tubes

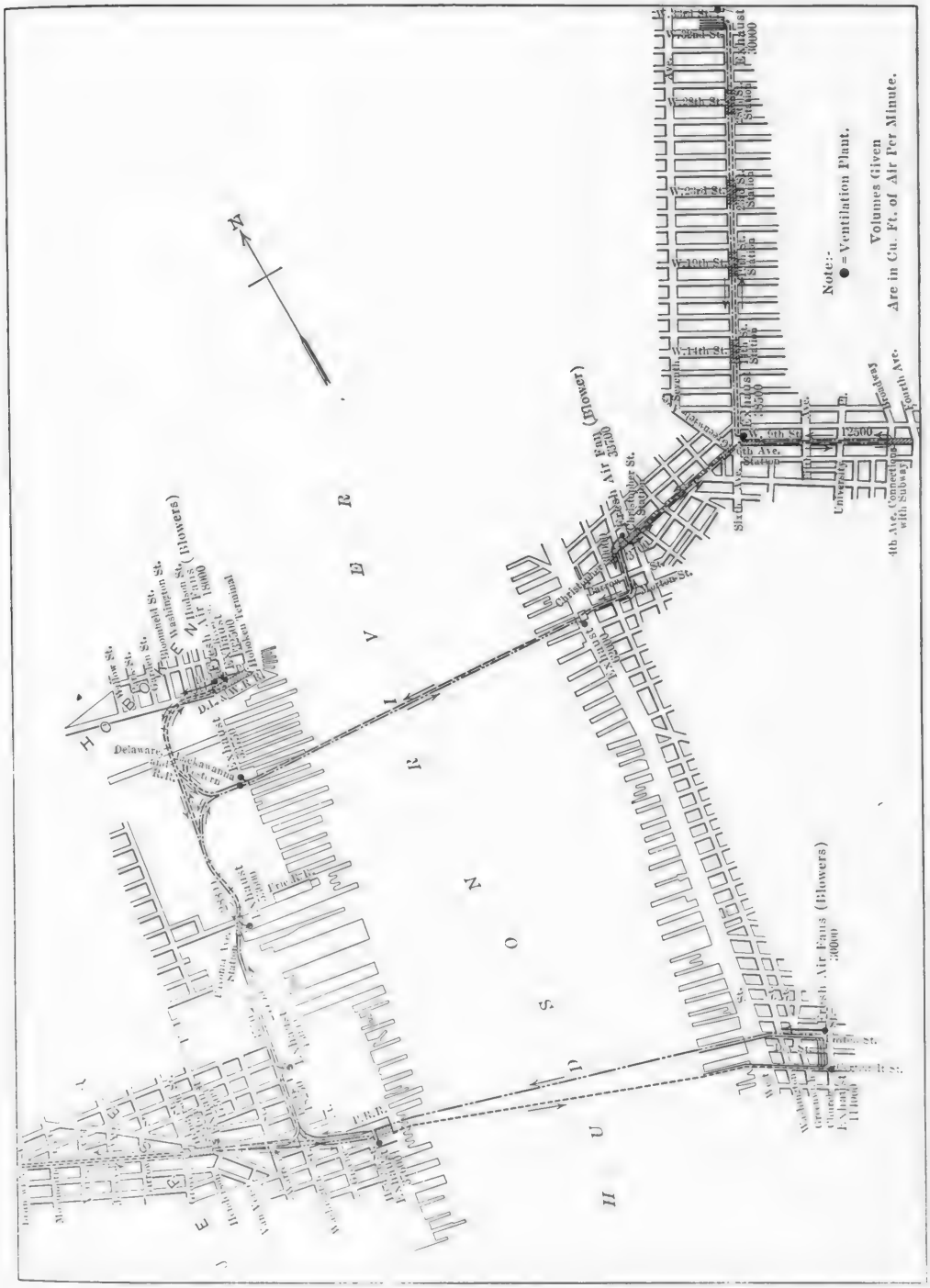
Test of the System Installed in the Tunnels of the Hudson and Manhattan Railroad Company

By A. W. Hodgson,

ASSISTANT ENGINEER, HUDSON AND MANHATTAN R. R. CO.

The tunnel system of the Hudson & Manhattan Railroad Company has been in operation about 2¼ years, between Hoboken and Sixth Avenue, New York, and the downtown section almost a year. Those sections now in operation extend from the Terminal Building, at the lower end of New York, under the river to Jersey City, thence under ground to the Erie and Lackawanna railroad stations, whence they pass under the river again back to Manhattan at a point about 1¼ miles above the downtown tubes. Continuing below ground, the tunnels extend to Sixth avenue and thence to Twenty-third street. Extensions are now under way which will carry the tunnels further up Sixth avenue to Thirty-third street, and eventually to the Grand Central Station at Forty-second street and Fourth avenue. Another extension will be built from Sixth avenue and Ninth street across the city to Fourth avenue and Astor place, and in New Jersey the extension to Newark is now under construction. This branch will come to the surface about two miles west of the Pennsylvania Railroad station.

The total length of tunnels when


Note:-
● = Ventilation Plant.
Volumes Given
Are in Cu. Ft. of Air Per Minute.
Exhaust 30000
Fresh Air Fans (Blowers) 30000
Fresh Air Fan 3500
Fresh Air Fans (Blowers) 18000
Exhaust 18000
Exhaust 12500
Fresh Air Fans (Blowers) 30000
Exhaust 30000
Fresh Air Fans (Blowers) 30000
Exhaust 30000
Fresh Air Fans (Blower) 3500
Exhaust

the system is completed will be 19 miles. The distance between different stations is as follows:

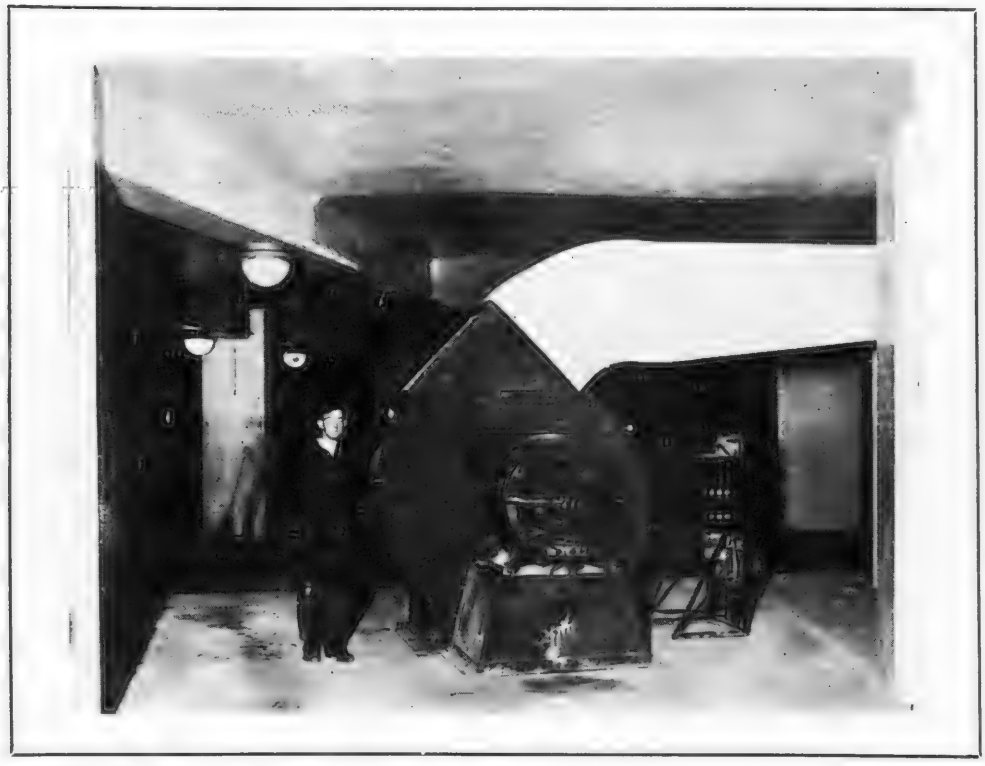
Church Street Terminal to Pennsylvania Station, 1¼ miles, approx.

Pennsylvania Station to portal on Newark line extension, 1½ miles, approx.

Pennsylvania Station to Erie Station, 1 mile, approx.

Hoboken Station to Christopher Street Station, 2 miles, approx.

of the Hudson Companies. They are single-track tubes, there being no connection between adjacent tubes except at junctions and at some stations. This plan has been adopted throughout, and it is of great importance in the ventilation of all tunnels or subways, as only by this means can full advantage be taken of the piston action of the trains to maintain efficient circulation of the air. The Fourteenth, Nineteenth and Twenty-



ONE OF THE 80-IN. SUPPLY FANS AT THE CHURCH STREET TERMINAL, HUDSON RIVER TUBES

Christopher Street Station to Twenty-third Street Station, 1⅛ miles, approx.

Twenty-third Street Station to Forty-second Street Station, 1½ miles, approx.

A brief description of certain portions of the construction of the tunnels is necessary in order that the conditions which govern the ventilation may be clearly understood.

The Hudson tunnels now in operation were designed and built by Charles M. Jacobs, the chief engineer

third street stations are constructed on the same principle, but structural and operating requirements would not permit the scheme at other stations.

The effective area of the iron-lined tunnel is 160 sq. ft., and of the concrete-lined tunnel 166 sq. ft. This is with ballast and bench wall in place. The cross-section of the standard tunnel car is approximately 90 sq. ft., which leaves a clearance area of 70 sq. ft. and 76 sq. ft., respectively, for the iron and concrete tunnels.

ORIGINAL DESIGN OF VENTILATION SYSTEM

The original layout of the ventilating system was made by A. C. Powers, formerly ventilating engineer with the Hudson Companies, and is illustrated in Fig. 1. This layout was designed to take full advantage of the piston action of the trains and to draw out the foul air with exhaust fans, while using the station entrances to admit fresh air. But in three cases, as shown on the diagram, it was considered necessary to install fresh-air blowers to supplement the air delivered through the entrances, which were either too small or too far apart for this purpose, and also to create sufficient circulation should trains become stalled in the tunnels.

The capacity of the fans was designed to give 30 cu. ft. of air per passenger per minute when traffic is at a maximum during morning and evening rush hours, and this capacity would change the air in the tunnels approximately 2½ times every hour.

The installation of fans has not been completed, those at the Ninth Street, Erie and Pennsylvania stations being omitted until tests could be made under operating conditions to prove their necessity.

ELECTRICAL EQUIPMENT

All fans are motor driven, the motors being coupled direct to the fan shaft. The motors were specially built to comply with the rigid specifications of the engineers in charge of the work. They are of the inter-pole type, and are designed to operate under large voltage fluctuations. They are extremely rugged, reliability being of extreme importance in this installation. The speed variation in these motors is 20%. All speed changes are obtained economically by field control. All of the motors for the various plants, with one exception, are of the C. & C. type, manufactured by the Garwood Electric Company. The motors are designed to operate on a 625-volt circuit which has fluctuations between 500 and 750 volts.

The specifications and plans for the electrical equipment were made by R. B. Stilwell and W. Hazleton, consulting electrical engineers for the Hudson & Manhattan Railroad Company.

Following is a list of the ventilating equipment installed up to date:

DESCRIPTION OF APPARATUS INSTALLED

Size of Fan in Inches	Diam. of Wheel in Inches	Capacity in Cu.Ft. Air per Min.	H. P. of Motors	R.P.M.	Type	Location
160	96	57,000	45	250	Exhaust	Church Street Terminal
160	96	57,000	45	250	Exhaust	Church Street Terminal
80	48	15,000	75	1,150	Plenum	Church Street Terminal
80	48	15,000	75	1,150	Plenum	Church Street Terminal
90	60	18,000	13	345	Plenum	Hoboken
90	60	18,000	13	345	Plenum	Hoboken
120	84	32,250	40	300	Exhaust	Hoboken
120	84	32,250	40	300	Exhaust	Hoboken
90	96		30	230	Cone	15th St. Shaft (near Caisson 1)
90	96		30	230	Cone	15th St. Shaft (near Caisson 1)
90	60	33,000	50	545	Plenum	Christopher Street Station
90	60	33,000	50	545	Plenum	Christopher Street Station
160	108	62,000	55	215	Exhaust	Morton Street Shaft
160	108	62,000	55	215	Exhaust	Morton Street Shaft

The fans are of the American Blower Company and Massachusetts Fan Company make.

OBJECT OF TEST

About October, 1909, when traffic was rapidly increasing, the quality of the air in the tunnels became appreciably affected, and in November the writer was appointed to make whatever tests were necessary and to report on what steps should be taken to improve matters. For this purpose the writer made a series of anemometer tests to ascertain the direction and

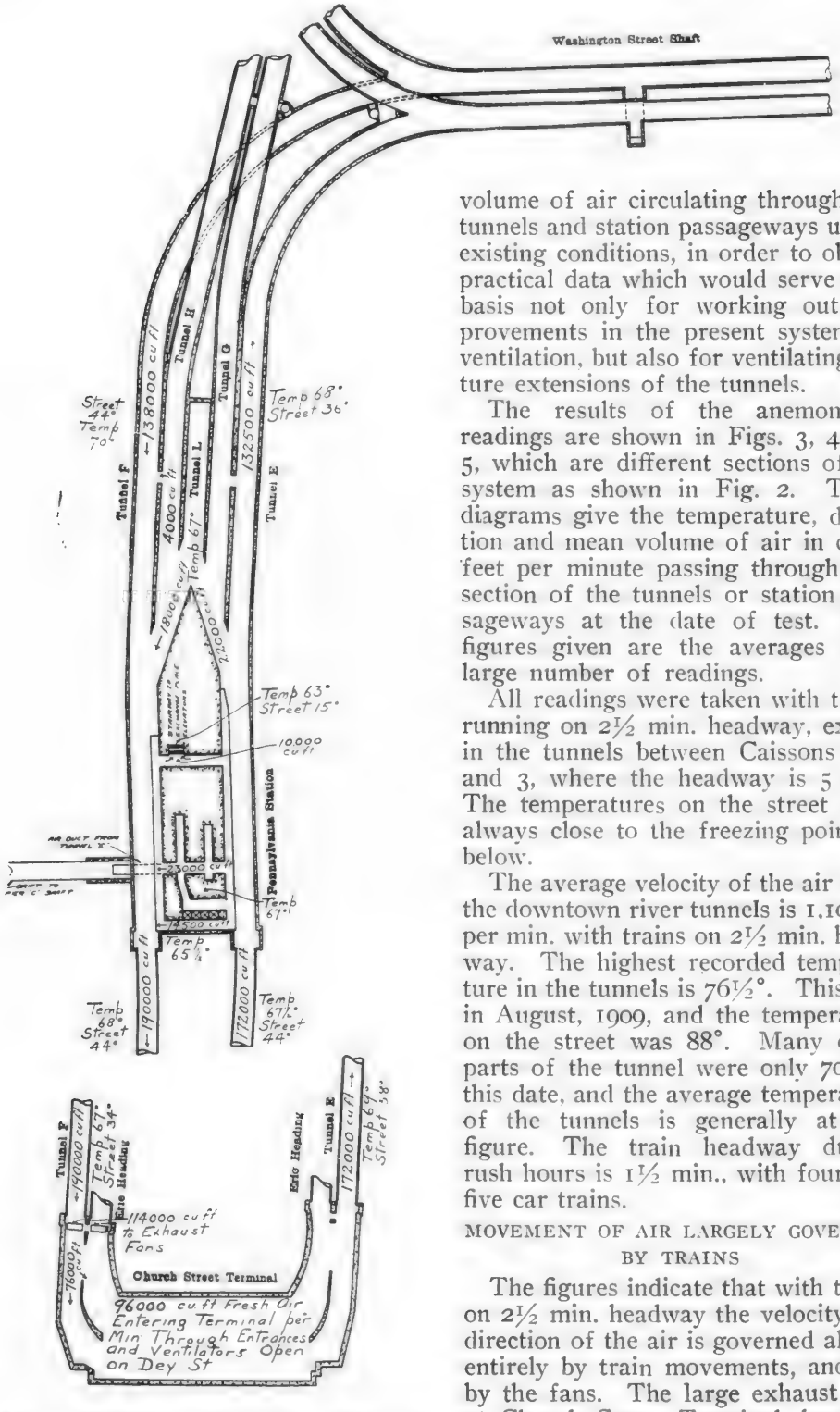


FIG. 3—SECTION A OF HUDSON AND MANHATTAN RAILWAY TUNNEL, SHOWING RESULT OF VENTILATION TESTS

volume of air circulating through the tunnels and station passageways under existing conditions, in order to obtain practical data which would serve as a basis not only for working out improvements in the present system of ventilation, but also for ventilating future extensions of the tunnels.

The results of the anemometer readings are shown in Figs. 3, 4 and 5, which are different sections of the system as shown in Fig. 2. These diagrams give the temperature, direction and mean volume of air in cubic feet per minute passing through any section of the tunnels or station passageways at the date of test. The figures given are the averages of a large number of readings.

All readings were taken with trains running on 2½ min. headway, except in the tunnels between Caissons 1, 2 and 3, where the headway is 5 min. The temperatures on the street were always close to the freezing point or below.

The average velocity of the air from the downtown river tunnels is 1,100 ft. per min. with trains on 2½ min. headway. The highest recorded temperature in the tunnels is 76½°. This was in August, 1909, and the temperature on the street was 88°. Many other parts of the tunnel were only 70° on this date, and the average temperature of the tunnels is generally at this figure. The train headway during rush hours is 1½ min., with four and five car trains.

MOVEMENT OF AIR LARGELY GOVERNED BY TRAINS

The figures indicate that with trains on 2½ min. headway the velocity and direction of the air is governed almost entirely by train movements, and not by the fans. The large exhaust fans at Church Street Terminal, handling 114,000 cu. ft. of air per minute, increase the velocity in the river section

of Tunnel F less than 10% over the velocity in Tunnel E.

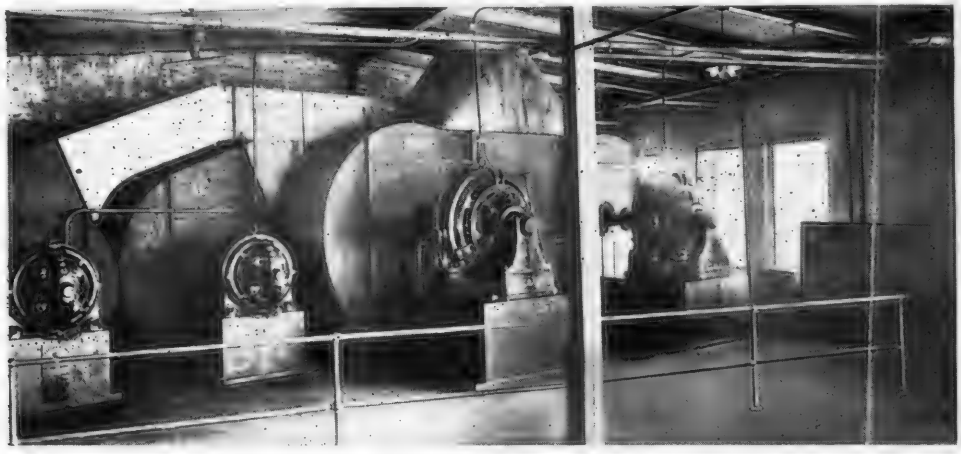
The velocity in the river section of Tunnel E is influenced largely by the number of doors and ventilators open on Church Street Terminal entrances, and fell from 180,000 cu. ft. on December 13 to 126,000 cu. ft. per minute on December 23, when all doors and ventilators were closed.

It is, therefore, evident that the function of the fans is only to take the air pushed to them by the trains or to deliver fresh air where the trains can push or draw it in through the stations and tunnels, and this fact should mainly govern the locations for other fans and the air ducts.

topher and Erie stations, also crossovers, such as Ninth street and Nineteenth street, about 70% of the air crosses the platform or tracks within 50 ft. from the end at which it enters and follows the direction of traffic in the adjacent tunnel. The 30% leaves the station in the same tunnel in which it enters.

These results prove that wherever passages or connections of considerable area are made between two adjacent tunnels, the section of tunnel between any two such connections must be considered independently, and cannot be efficiently ventilated by fans or shafts not within that section.

The tunnels between the Church



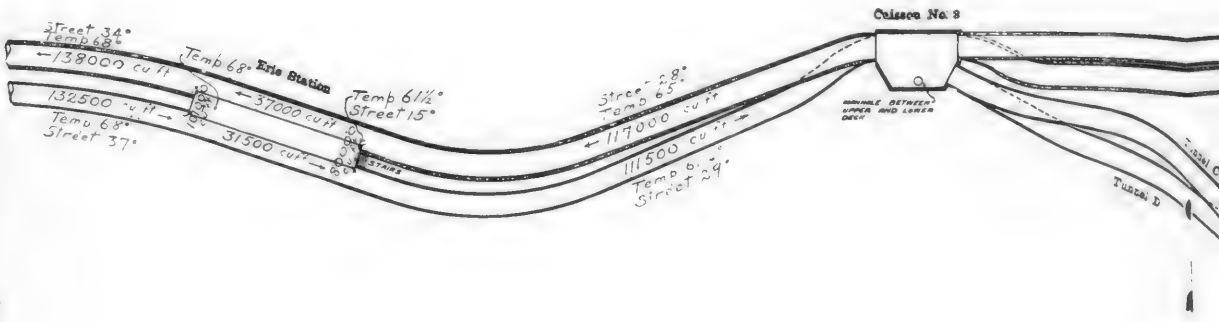
TWO 120-IN. EXHAUST FANS AND TWO 90-IN. SUPPLY FANS AT THE HOBOKEN SHOPS

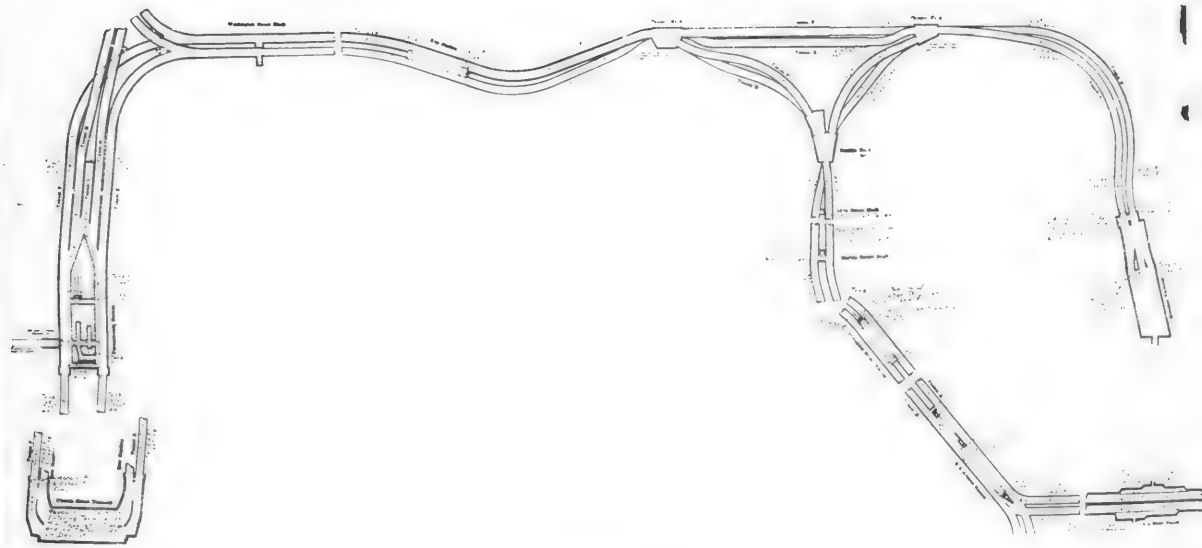
RESULTS OBTAINED

The circulation of the air can be better understood by a study of the diagrams (Figs. 3, 4 and 5) than by description, and reference will be made only to those figures which have received special attention, and on which suggested improvements were based.

In the river sections of the iron-lined tunnels, with trains on 2½ min. headway and attaining an average speed of 30 miles per hour, the mean volume of air passing at any point is 180,000 cu. ft. per minute, provided the air is not restricted by closing all possible inlets.

At island platforms, such as Christopher Street Terminal, Erie and Newark Avenue stations depend almost entirely for fresh air on the entrances at the Church Street Terminal. The doors at the Erie Station were closed when the tests were being made, but the current across the platform from Tunnel F to Tunnel E in front of the stairs was steady and at times very strong, so that the air from the stairway would be carried toward Caisson 3 if the doors were open. This was proved by the temperatures as well as by the air velocities at Christopher Street station, where similar conditions prevail. The air on the south side of the platform close to the stairs was 60°, and on the north side 52°.

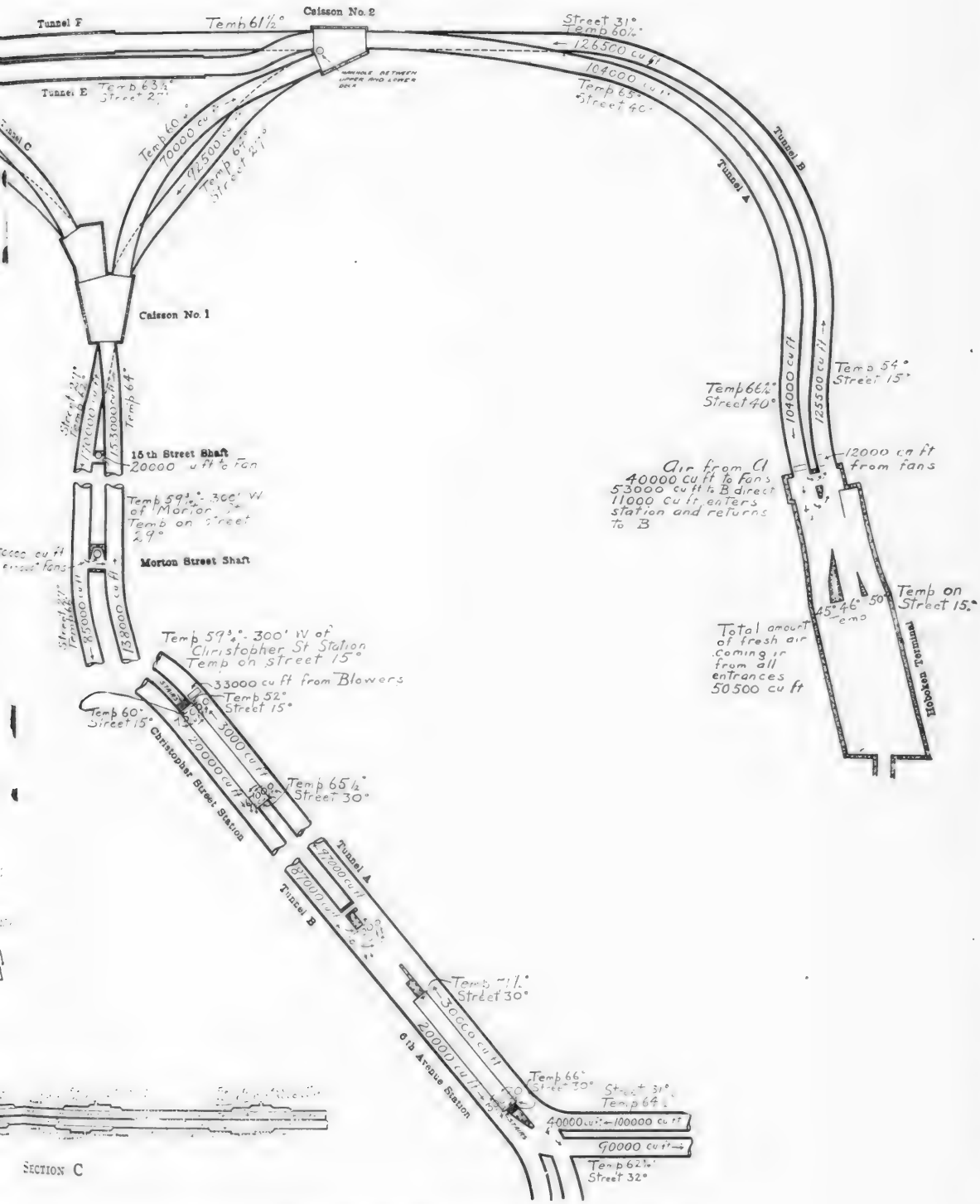




SECTION A SECTION B

FIG. 2—DIAGRAM SHOWING BLOCK PLAN OF TUNNEL SYSTEM

FIG. 4—CHART SHOWING RESULTS OF VENTILATION



ON TESTS IN SECTION B OF HUDSON AND MANHATTAN RAILROAD TUNNELS

The doors were open about 6 in., the velocity of the air holding them there in spite of the door checks.

NECESSARY TO OVERCOME DRAFTS

At the Church Street Terminal ample ventilation is afforded by the large entrances on the street if some of the ventilators or doors are left open, but this caused such discomfort to the tenants on the concourse floor in cold weather that it was imperative to deliver air to the track floor, so that the ventilation of the platforms would be practically independent of the concourse. For this purpose a large blower, originally designed to ventilate the basement of the Terminal Building, is now used, and delivers about 30,000 cu. ft. of air per minute at the south end of the loading platforms. This is drawn through the station and into Tunnel E by the trains in this tunnel, and very little finds its way to the concourse. Air always enters by the doors on the street level when passengers pass through, as there is 30,000 cu. ft. from the fans and 76,000 cu. ft. from Tunnel F, or 106,000 cu. ft., and the trains will draw 180,000 cu. ft. if the air is not restricted.

The 76,000 cu. ft. entering the Church Street Terminal from Tunnel F is the amount which passes the exhaust fans on Cortlandt Street approach. 190,000 cu. ft. per minute passes through Tunnel F from the Pennsylvania Railroad Station to the Church Street Terminal, and only 114,000 cu. ft. of this is taken out by the exhaust fans. The exhaust fans at the Church Street Terminal have to draw out nearly all the foul air between Church Street, Erie and Newark Avenue stations, which represents about five miles of tunnel. The passage to Exchange Place elevators acts as an outlet, but only discharges 10,000 cu. ft. per minute.

CHANGES AS RESULT OF TEST

Two fans are to be installed at the Washington Street shaft, capable of exhausting 50,000 cu. ft. per minute, each to assist the ventilation of this section.

When the Newark Avenue station is open, 70% of the fresh air coming from the portal at Summit avenue will be returned in the west-bound tunnel, as in all other stations of similar construction. The 30% that passes this station will be divided between the tunnels going to Church Street and Erie stations, and will be approximately 20,000 cu. ft. per minute with trains on 5-min. headway, or 40,000 cu. ft. on a 2½-min. headway. To increase further the volume of fresh air entering the downtown tunnels, two blowers are now to be installed at Railroad Avenue shaft, having a capacity of 50,000 cu. ft. per minute each. No ducts will be required, and the frictional resistance will be very low, greatly reducing both the first cost and operating expenses. The present working drift will be used as the duct. The air will pass to the four tunnels at this section and will be circulated by the trains through the tunnels between Church Street, Newark Avenue and Erie stations as shown on the diagram. Dampers will be placed at the opening to each tunnel for proper regulation. The Henderson street entrance of Newark Avenue station will admit fresh air to the downtown tunnels.

The test has shown that the tunnels north of Erie Station to Caisson 3 and those connecting Caissons 3 and 2 and Caissons 3 and 1 do not get sufficient ventilation. They depend for fresh air on the entrances and blowers at Hoboken, on the blowers at Christopher Street, which air has already

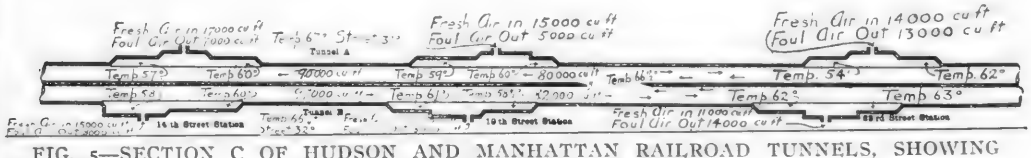


FIG. 5—SECTION C OF HUDSON AND MANHATTAN RAILROAD TUNNELS, SHOWING RESULTS OF VENTILATION TESTS

been partly exhausted at Fifteenth Street, and at the station entrance at Erie Station, which is always closed in cold weather.

To remedy this, it was proposed to install at the Erie Station one exhaust fan for Tunnel F and one blower for Tunnel E. The idea of installing fans to deliver fresh air at the Erie Station was abandoned on account of the smoke and soot from the Erie Railroad locomotives, which are very heavy at this point.

As an alternative to installing either exhaust or fresh-air fans at the Erie Station, the elevator shaft used during construction at Caisson 3, from the roof to the surface, has been reopened. This gives nearly as good ventilation as the fans to Tunnels E, F, C, D and B, north of Erie Station, the air following the direction shown on the diagram (Figs. 6 and 7).

No air will be exhausted at the Erie Station with this arrangement, as the fresh air drawn in at Caisson 3 would be partly taken out after having passed through only 500 ft. of tunnel; also, if an exhaust fan is installed at

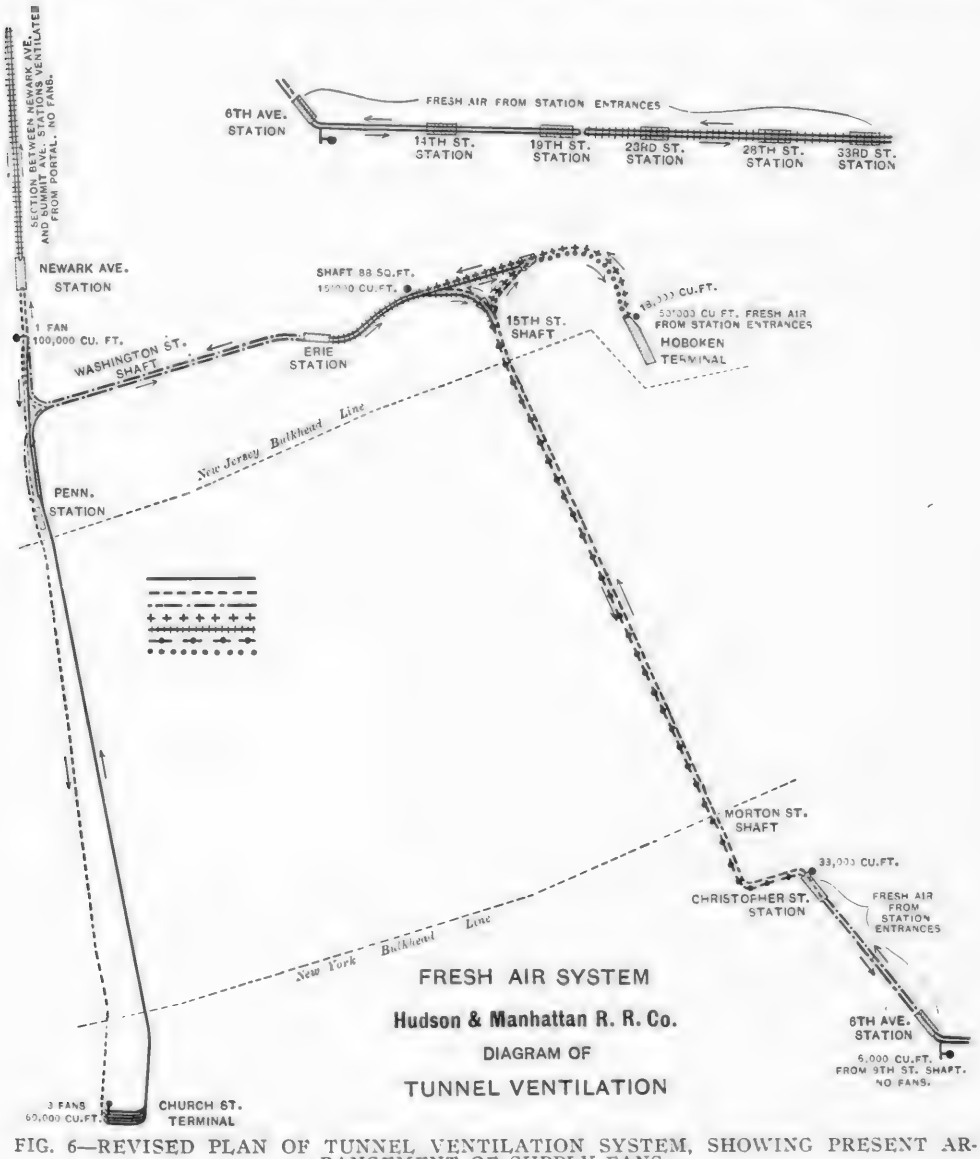


FIG. 6—REVISED PLAN OF TUNNEL VENTILATION SYSTEM, SHOWING PRESENT ARRANGEMENT OF SUPPLY FANS

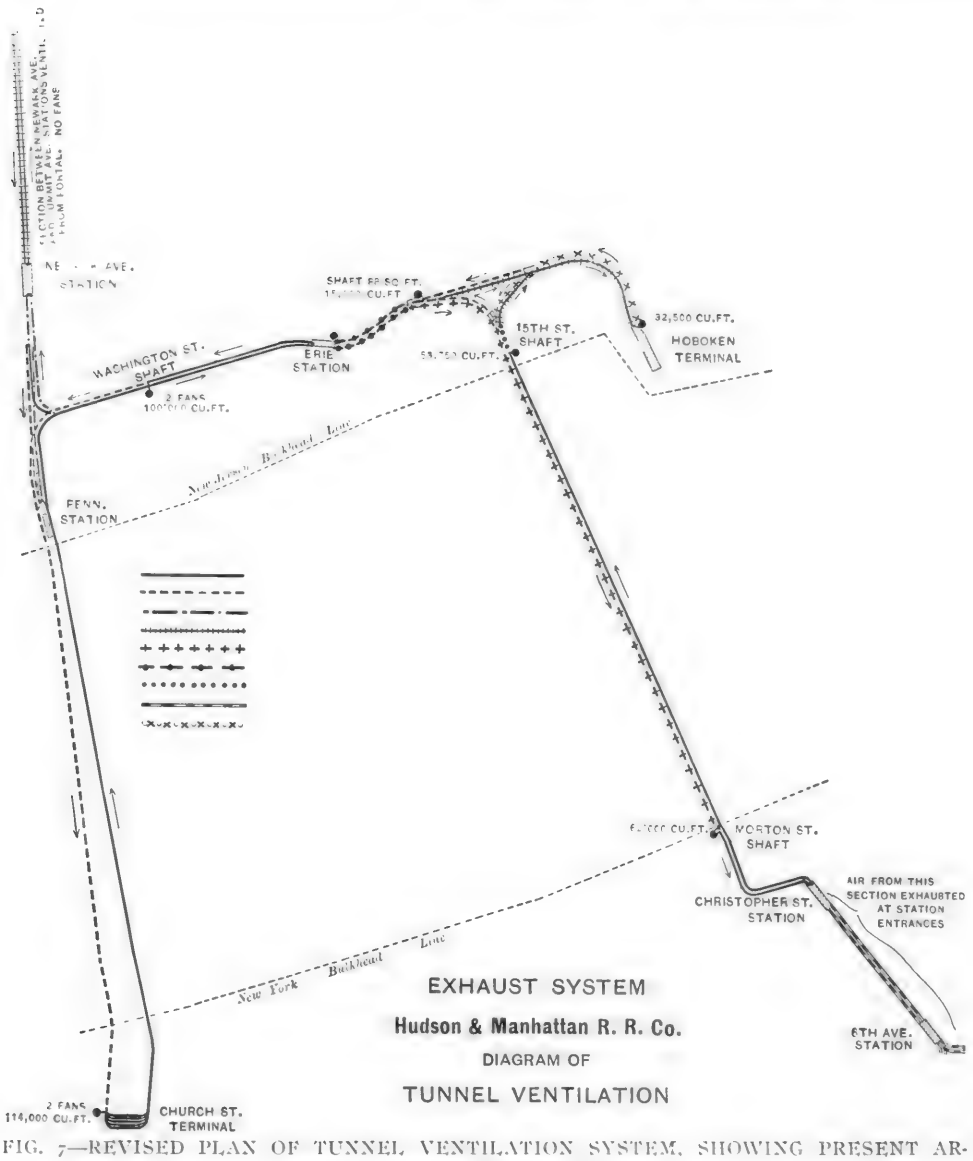


FIG. 7—REVISED PLAN OF TUNNEL VENTILATION SYSTEM, SHOWING PRESENT ARRANGEMENT OF EXHAUST FANS

this station to draw air from Tunnel F without a blower to deliver air to Tunnel E, the trains moving from Erie Station toward Caisson 3 in Tunnel E will draw a larger volume of air down the stairway from the street, which is what it is desired to avoid.

The Hoboken Station stairways admit about 50,000 cu. ft. of fresh air per minute. Practically no air is exhausted at the entrances. The 104,000 cu. ft. of air per minute blowing toward Hoboken in Tunnel A goes back into Tunnel B at the crossover in Hoboken Station, except 40,000 cu. ft. which is taken out by the exhaust fans.

The tests show that Tunnels A and B from Hoboken to Christopher Street are thoroughly ventilated by the blowers and entrances at the Hoboken and Christopher Street stations.

The area of the entrance to the Ninth Street Station is smaller than any other station passage, and the velocity of the air is so high that men cannot stand it in cold weather if the doors are opened. To overcome this difficulty, the shaft at Ninth Street and Sixth Avenue has been opened, and

6,000 cu. ft. of air per min. now enters the tunnels at this point.

Two diagrams have been prepared (Figs. 6 and 7), one showing additional exhaust fans working in conjunction with the present installation, and the sections of tunnel mainly ventilated by each; the other shows the blowers and fresh-air system.

The results prove that the original layout and estimate of the capacity of the fans required was in all cases sufficient to give good ventilation. The new fans being installed as a result of the tests will give approximately the same total capacity, but the locations have been changed where the construction of the tunnels has shown this to be advantageous, and in two cases vent shafts are being used in place of fans.

In the original design it was considered necessary to install all fans in duplicate. This idea has now been abandoned, as it has been found quite possible to shut down any fan for a day or more for repairs without appreciably affecting the air in the tunnels. All the fans and motors have been installed and tested under the supervision of the author, in conjunction with the electrical engineers, and the results obtained fulfilled all requirements of the specifications. In installations of large capacity, such as are required for a system of deep tunnels, where access to the surface is only possible at long intervals, the design of the fans and air ducts requires very careful study. If they are not properly proportioned, the ventilation will become a very expensive proposition, both in first cost and in operation.

A test of the quality of air in the tunnel system was made recently by Dr. Thomas B. Stillman, chemical engineer of the Stevens Institute of Technology, who says, in a report dated March 1, 1910:

"I have made careful and thorough analysis of air taken from the under-river portion of the Hudson Tunnels, and find that it contains slightly less than 3.5 parts of carbon dioxide in 10,000.

"I have also taken samples of air in the afternoon rush hour between 5 and 6 P. M. in the cabins of the principal ferryboats crossing the Hudson River, with the following results: The air in the women's cabins showed an average of 9.4 parts of carbon dioxide, and in the men's cabins an average of 17.6 parts of carbon dioxide. The amount of carbon dioxide measures the extent of contamination or impurity of the air, thus showing that in the cabins of the ferryboats, artificially heated and not thoroughly ventilated, there are from three to six times as much carbon dioxide as is contained in pure air.

"Thorough analyses of samples of air taken from crowded trains of the Hudson Tunnels between 5 and 6 P. M. showed that the amount of carbon dioxide was between 5 and 6 parts only. Air from the tunnels, not taken from the trains, gave 3.5 parts of carbon dioxide, showing it to be as pure as the air outside."

As regards the purity of the air as shown by the above analysis, which might seem to be at variance with the writer's statements, it should be borne in mind that it is just as essential to change the air frequently in order to remove the odors caused by the heated oil on the motors of the trains and the dampness which is always present in deep tunnels.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS

The semi-annual (mid-summer) meeting of The American Society of Heating and Ventilating Engineers will be held at St. Louis, Thursday, June 30, and Friday, July 1. Headquarters will probably be at the new American Hotel, which is just being completed. Members and guests are assured of a hospitable welcome and entertainment through the appointment of a local committee, of which Prof. J. H. Kinealy is chairman.

At the April meeting of the Illinois Chapter of the American Society of Heating and Ventilating Engineers, a paper was read by George Mehring, describing the hot water heating system installed in the summer home of Mr. Armour, near Lake Forest, Ill. A discussion of pressure regulating valves was introduced by John Boylston, of the Western Specialty Co., Chicago.

THE HEATING AND VENTILATING MAGAZINE

Vol. 7 May, 1910 No. 5

PUBLISHED MONTHLY AT
1123 BROADWAY, NEW YORK
BY THE
HEATING AND VENTILATING MAGAZINE CO.
President A. S. ARMAGNAC
Secretary and Treasurer, G. PETERSEN
The address of the officers is the address of this magazine.

A. S. ARMAGNAC, Editor — G. PETERSEN, Advertising Mgr.

European Representative:
AMERICAN PUBLICATION BUREAU, 46, Upingham Road, Leicester, England

Subscription, - - - - - $1.00 per year
Foreign countries, - - - - 1.50 " "
Back numbers, - - - - - 15 cents a copy

IN CONNECTION with a proposed new factory ventilation law now before the New York State legislature, introduced at the instance of the State Commissioner of Labor, a sharp difference of opinion has arisen over the method for determining the fulfillment of the ventilation requirements. The Commissioner of Labor proposes a carbon dioxide test pure and simple, with a limit of 10 parts of CO_2 in 10,000 parts of air during the usual working hours, and 15 parts at other times. Heating and ventilating engineers generally have long since adopted the basis of introducing a certain quantity of fresh air at a stated rate.

Nothing is said in the proposed bill as to what part of the room containing the air to be tested the sample shall be taken from, and this feature alone is enough to condemn the bill. The principal objection to the present law is that the power conferred upon the Commissioner of Labor is too arbitrary in permitting him to define the standard of ventilation. Yet his new powers will be equally arbitrary if he is permitted to name the points at which the prescribed purity of the air shall be maintained.

Instead, therefore, of improving matters, it is more than likely that the proposed legislation, if passed, will create equal dissatisfaction to that which has arisen under the present law, and the alert committee of the heating engineers' society, by placing itself, as it has, in opposition to the measure, will have accomplished a useful purpose, even though its efforts may not be able to prevent the passage of the bill in its present form. Its position in the matter is at least clearly understood, and the society may yet have the satisfaction of procuring a rational factory ventilation for New York State.

THE forthcoming second annual convention of the National District Heating Association calls renewed attention to this vigorous young society of central station heating men. When one considers that there are some 400 central station heating plants in the United States, the remarkable thing is that an organization devoted exclusively to their interests was not formed earlier. An unusually ambitious programme laid out for this association's approaching meeting, in Toledo, June 1-3, speaks well for the enthusiasm and interest of its members, and the organization will no doubt prove a strong and permanent factor in promoting this particular branch of the art.

DURING the summer months the weather charts, which have been a special feature of this magazine for several years, will be omitted. The publication of the charts and weather data will be resumed in the Fall.

MECHANICAL EQUIPMENT

Cast-Iron Fittings for Superheated Steam

The effect of superheated steam on cast iron valves and fittings was the subject of three papers recently presented before the American Society of Mechanical Engineers, two of which were published in THE HEATING AND VENTILATING MAGAZINE, one by Prof. Ira N. Hollis, of Boston, appearing in December, 1909, and the other, by Arthur S. Mann, of Schenectady, N. Y., appearing in February, 1910.

The paper by Professor Hollis stated that the examination of cast iron fittings after long exposure to superheated steam considerably above 500° in temperature has disclosed distortion, cracks and permanent change of shape. Test pieces taken from such fittings have shown irregularity of strength and apparently some reduction. The case has not been conclusively made out by exhaustive tests. The theories as to chemical change rest on doubtful grounds.

Three large cast iron fittings, two of which had been exposed in service longer than one year to superheated steam of 578° were burst by hydraulic pressure and found to be amply strong for all purposes, although the test pieces subsequently cut from them failed fully 10% below what should have been the tensile strength of air-furnace gun iron out of which they were made. No tests were made of the original metal, and nothing conclusive was proved except that the bursting strength of a 14-in. T was 1,650 lbs. per sq. in.

A calculation of the stresses set up by the expansion of the long line of pipe in which the Ts were placed gives a possible stress of nearly 4,000 lbs., and even more, due to expansion exclusive of the stresses imposed by the steam pressure. It would seem therefore that the deterioration, if any existed, was due to the absence of expansion joints.

The paper by Mr. Mann stated that there is a growing feeling among engineers that nothing but steel will answer as a container for highly superheated steam. A sound high-grade steel casting is practically unaffected by any reasonable superheat, and if the user is willing to pay 10c. or 12c. per pound he need fear no trouble from steel fittings and steel valves. Steel at 4c. or 5c. per pound has not always proven a success, and a reliable material of reasonable price is desirable for a great deal of steam pipe work. A high-grade cast iron is capable of withstanding the demands made upon it by superheated steam, and fittings made of this material have been in successful use for the past five years. The paper describes the experience with these fittings.

Commenting on the discussion brought out by the papers published in the Proceedings of the Society, Professor Hollis makes the following comments:

The discussion of these papers brings out certain interesting and valuable conclusions which cannot fail to assist in the proper use of cast iron for parts of machinery and boilers. Previously existing differences of experience with this metal under a high temperature are shown to be due to fundamental differences of chemical composition or to variations in the temperature. From this point of view, existing data, even though conflicting, can probably be reconciled. The following conclusions as the result of the papers and discussions may be studied with profit in connection with new construction:

Cast iron varies in its behavior under high temperature, starting from about 450° F. In many cases it deteriorates in structure and strength to a marked degree.

The effect of high temperature is independent of the medium producing it, whether superheated steam, hot gases or solids.

The change of structure or deterioration is much increased by a fluctuating temperature.

Where the temperature is constant, even though as high as 600° or 700° F., the change in cast iron is not serious enough to prohibit its use, but where the temperature varies considerably, the metal is certain to develop cracks and distortion that render it unsuitable for steam pipes and other parts under steam pressure.

Cast iron of certain chemical constituents increases materially in volume when subjected to fluctuating temperatures above 500° F.

The chemical composition of the cast iron has a material bearing upon the change of shape and volume and upon the development of imperfections.

Certain facts in this connection are well shown by Professor Rugan's experiments. As he states, cast iron containing only combined carbon does not change even under high fluctuating temperatures unless the carbon begins to separate into a graphitic form. Free carbon is one of the factors assisting in deterioration under high temperature, especially when associated with silicon. The latter seems to be the chief

cause of increase in volume. Where the free carbon is constant, the growth in dimensions is roughly proportional to the percentage of silicon.

The use of cast iron fittings for superheated strain is inadvisable where the temperature is likely to fluctuate, but it can safely be used where the temperature is to be constant.

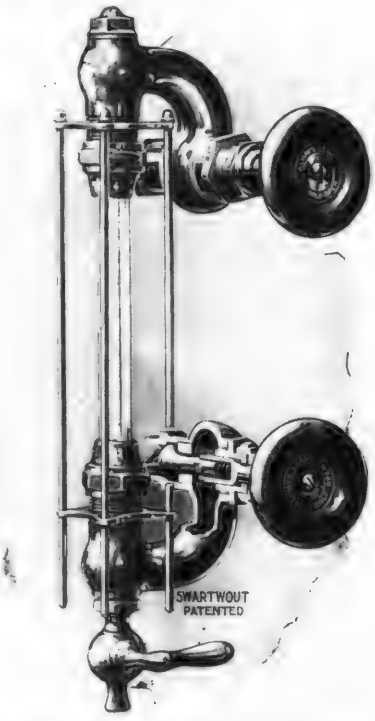
Cast iron fittings should not be placed in any parts of a steam pipe line where there are serious bending stresses in addition to the stresses produced by internal pressure, unless the combined stresses are fully allowed for or neutralized by expansion joints.

An Automatic Safety Water Gauge

A type of automatic safety water gauge, designed to eliminate, so far as is possible, the dangers resulting from broken gauge glasses and the consequent damage to both attendant and boiler, is shown in the accompanying illustrations. Quick-closing automatic valves operate instantly, cutting off the flow of water and steam the instant the glass breaks.

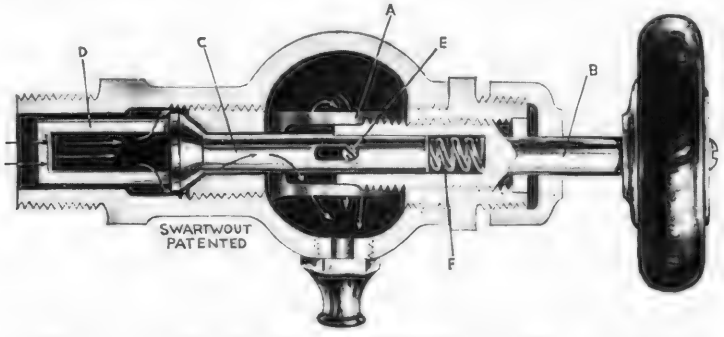
In each of the two gauge bodies there is an automatic valve held away from its seat while in use by a spring, shown at F in the sectional view of the gauge cock. In case of breakage this valve is closed quickly by the steam pressure in the boiler. The valve is also controlled by the hand wheel so that both valve and valve seat are easily removed for cleaning without disturbing the gauge at the boiler connections and without removing the packing of the gauge glass.

As shown in the sectional view the screw E holds the parts of the valve together, and when taken out with a small screw driver or pen knife all the parts are released. At the inner end of the valve stem C, a flat scraper D loosens any sediment adhering to the boiler connection and as it revolves with every turn of the hand wheel the opening is cleared frequently. The removable valve case A is provided with two external threads of the same pitch but of different diameters, so that the threads on the inner end may slip by the outer internal thread when inserted. The threads are cut so that both sets engage the threads of the gauge body at the same time, thereby insuring a good fit.



SWARTWOUT AUTOMATIC SAFETY WATER GAUGE

On replacing a broken glass the hand wheel is turned forward until the valve is forced from its seat, thus allowing water or steam to flow from the boiler into the gauge glass; the valve on the other gauge body will then automatically open to equalize the pressure. In turning the hand wheel forward to force the valve from its seat, the movement of the spring F in stem B must first be taken up before the valve moves. Every turn of the wheel turns the valves upon their seats. In this way they regrind themselves automatically.



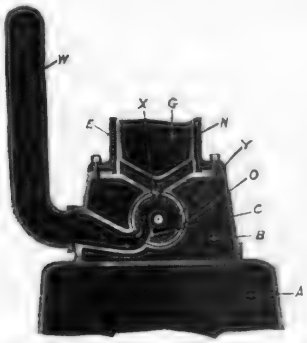
SECTIONAL VIEW OF THE SWARTWOUT WATER GAUGE COCK

When the valve case is removed there is an unobstructed opening into the boiler 1 in. in diameter, obtained without in any way disturbing the gauge bodies.

Another ingenious feature of the gauge glass is the gooseneck gauge body. This form of construction allows a gauge glass 2 to 4 in. longer than with other makes, thus giving greater visible range of water level. Offsetting the gauge glass renders the operation of replacing a broken gauge glass an easy task. It is inserted through either the top or bottom of the gauge without in any way disturbing the valves or seats. It need not be of any particular length, an inch or more making no difference. It permits the use of softer packings, which with the flexible construction relieves the strain on the gauge glass, thereby greatly reducing breakages. In cleaning also the value of the gooseneck is apparent, for by removing the top plug or the drain cock at the bottom, the swab for cleaning is easily inserted, without in any way disturbing the valves or gauge bodies.

The water gauge and gauge cock are made extra heavy to withstand a pressure of 250 lbs. They are adapted to all types of boilers and for marine, locomotive, stationary, and portable service. They are always provided with four rods and glass 24 in. long. These devices are manufactured by the Ohio Blower Co., Cleveland, O.

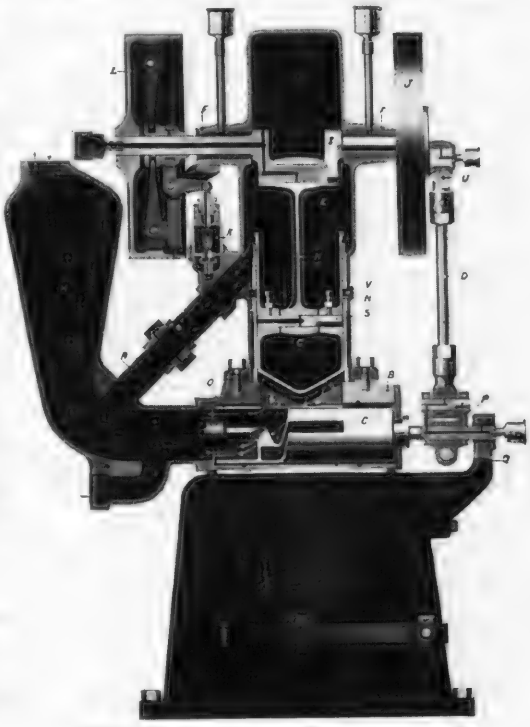
Palm Sanitary Cleaners, made by the Palm Engineering Co., 34-36 Bates St., Detroit, Mich., and described in a newly-issued catalogue, are designed for permanent installation in buildings of all



END SECTION OF VALVE USED WITH PALM PUMP

sizes. The Palm pump is designed to handle dust laden air, any combination of liquids and air, and many other liquids or materials without injury to the pumps. The principle of construction is as follows:

Between the cylinder E and the piston G a clearance space is provided. The automatic valve L supplies water from the service pipes to this clearance through this reserved chamber V, thus filling the clearance space and providing a perfect lubrication, as the piston runs on a film of water without metallic contact with the cylinder. This water flows only during the operation of the pump. Part of this water flows upwards lubricating the upper part of the cylinder, the rest flows downward lubricating the lower part of the cylinder and at the same



SECTIONAL VIEW OF PALM PUMP

time absolutely preventing cutting or damage from dust or other foreign substances. Everything is discharged through the exhaust port Y in the valve C, the dust and water passing to the sewer and the air going out through the exhaust pipe M.

Difficulties in Building Pipe Tunnel Through Sandstone

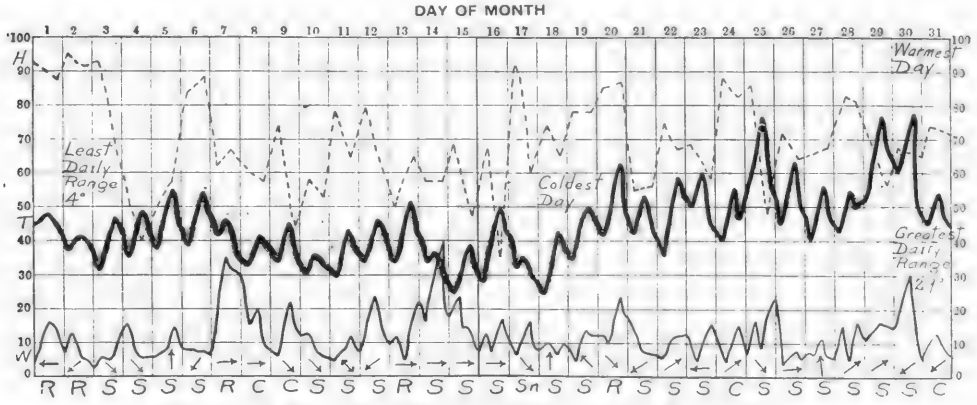
A series of experiments is being conducted by Deans Francis C. Shenehon and George B. Frankforter of the Minnesota State University with a view to securing a suitable lining for the tunnels of the heating plant which is to be built at the institution. The tunnels have to be cut through white sandstone and, as this disintegrates when exposed to air, some lining must be provided. Calcium silicate has been suggested, because this will harden and become transparent.

This substance becomes very hard and soaks several inches into the sand rock, but because it is slightly soluble in water, doubts have been expressed as to whether it will be satisfactory.

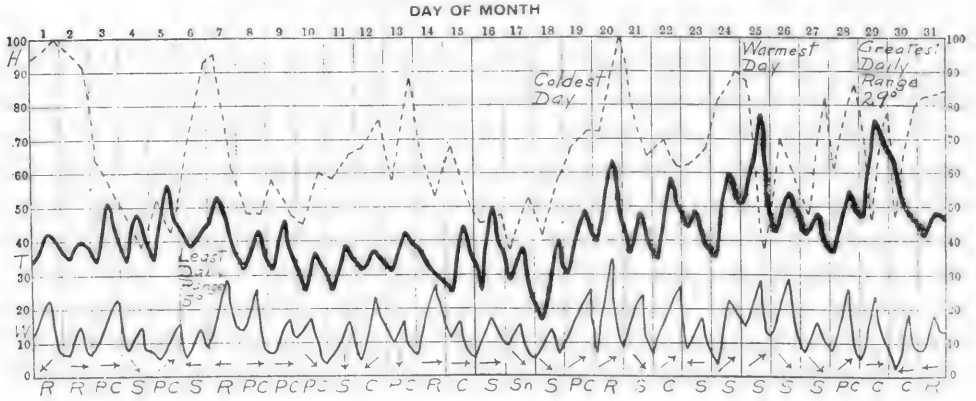
The Weather for March, 1910

	New York	Boston	Pitts burg	Chicago*	St. Louis*
Highest temperature, deg. F.	78	78	83	81	87
Date of highest temperature	30	25	24	27	23
Lowest temperature, deg. F.	24	17	21	26	29
Date of lowest temperature	18	18	15	15	15
Greatest daily range, deg. F.	29	28	32	36	37
Date of greatest daily range	30	29	24	23	2
Least daily range, deg. F.	4	5	9	5	9
Date of least daily range	2	6	14	9	9
Mean temperature for month, deg. F.	45	42	49	49	58
Normal mean temperature for this month	37.5	35	40	34.4	45
Total rainfall, inches	0.86	1.25	0.37	0.29	0.14
Total snowfall, inches	0.4	0.2	0.7	Trace	None
Normal precipitation, this month	4.10	4	3.13	2.55	3.35
Total wind movement, miles	7983	7957	7015	10921	7963
Average hourly wind velocity, miles	10.7	10.7	9.4	14.7	10.7
Prevailing direction of wind	N. W.	West	N. W.	S. W.	S. W.
Number of clear days	13	11	13	18	22
Number of partly cloudy days	13	9	11	11	7
Number of cloudy days	5	11	7	2	2
No. of days on which rain or snow fell	6	7	7	3	3
Snow on ground at end of month, inches.	None	None	None	None	None

*This month was the warmest, driest and sunniest March since the official records began in 1871.



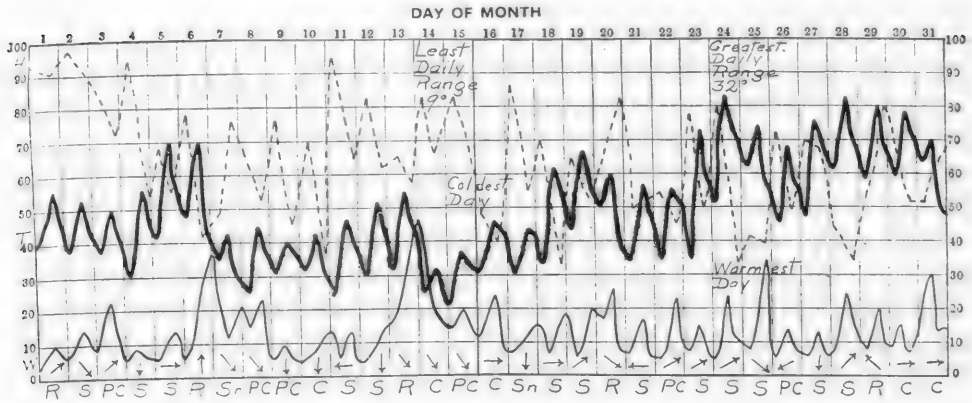
RECORD OF THE WEATHER IN NEW YORK FOR MARCH, 1910


DAY OF MONTH
Warmest Day
Greatest Daily Range 29°
Coldest Day
Least Daily Range 5°
R R PC S PC S R PC PC PC S C PC R C S Sn S PC R S C S S S S S PC C C R

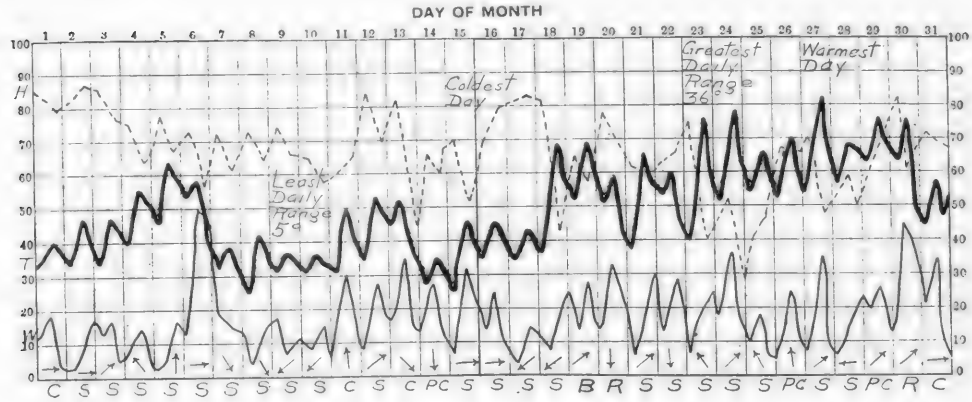
RECORD OF THE WEATHER IN BOSTON FOR MARCH, 1910

Plotted from records especially compiled for THE HEATING AND VENTILATING MAGAZINE by the United States Weather Bureau.

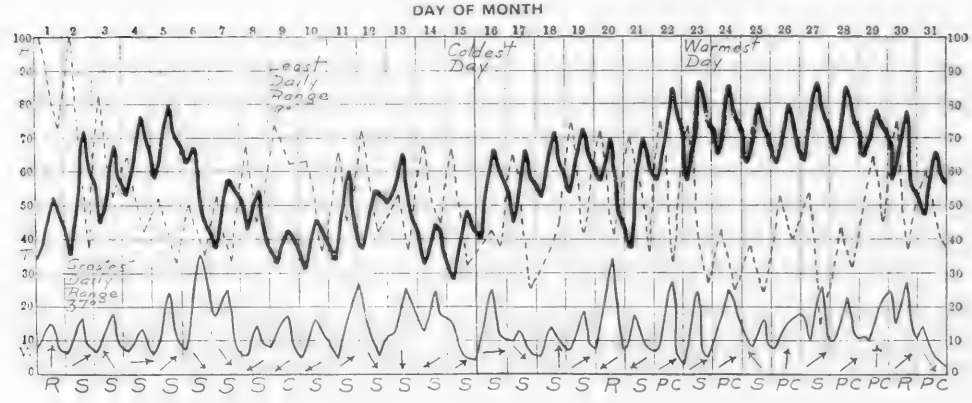
Heavy lines indicate temperature in degrees F.
Light lines indicate wind in miles per hour.
Broken lines indicate relative humidity in percentage.
S—clear, P C—partly cloudy, C—cloudy, R—rain, Sn—snow.
Arrows fly with prevailing direction of wind.


DAY OF MONTH
Least Daily Range 9°
Greatest Daily Range 32°
Coldest Day
Warmest Day
R S PC S S S R S PC PC C S S R C PC C Sn S S R S PC S S S PC S S R C C

RECORD OF THE WEATHER IN PITTSBURG FOR MARCH, 1910


DAY OF MONTH
Coldest Day
Greatest Daily Range 36°
Warmest Day
Least Daily Range 5°
C S S S S S S S S S C S C PC S S S S B R S S S S S PC S S PC R C

RECORD OF THE WEATHER IN CHICAGO FOR MARCH, 1910


DAY OF MONTH
Coldest Day
Warmest Day
Least Daily Range 7°
Greatest Daily Range 37°
R S S S S S S S C S S S S S S S S S S R S PC S PC S PC S PC PC R PC

RECORD OF THE WEATHER IN ST. LOUIS FOR MARCH, 1910

Plotted from records especially compiled for THE HEATING AND VENTILATING MAGAZINE by the United States Weather Bureau.

Heavy lines indicate temperature in degrees F.

Light lines indicate wind in miles per hour.

Broken lines indicate relative humidity in percentage.

S—clear, P C—partly cloudy, C—cloudy, R—rain, Sn—snow.

Arrows fly with prevailing direction of wind.

Proposed New Factory Ventilation Law for New York State

A new factory law, based upon the purity of the air in workrooms, rather than upon the quantity of fresh air supplied, is proposed in a bill recently introduced in the New York State legislature. It is drawn up in accordance with the ideas of the State Commissioner of Labor, John Williams. The bill, as presented, has aroused determined opposition on the part of many heating engineers, including the committee on legislation for New York State of the American Society of Heating and Ventilating Engineers.

At a public hearing in Albany, April 27, this committee appeared before the Senate Judiciary Committee, to which the bill covering the subject was referred. While no definite action has as yet been taken on the bill, it is hoped that the proposed law will at least fail of passage. The heating society's committee has, however, offered an amendment which, if incorporated with the bill, would make the measure acceptable.

THE PRESENT LAW.

In its present form, the New York State factory law states that the owner, agent or lessee of a factory shall provide, in each workroom thereof, proper and sufficient means of ventilation, and shall maintain proper and sufficient ventilation; if excessive heat be created, or if steam, gases, vapors, dust or other impurities that may be injurious to health be generated in the course of the manufacturing process carried on therein, the room must be ventilated in such a manner as to render them harmless, so far as is practicable; in case of failure the commissioner of labor shall order such ventilation to be provided.

Such owner, agent or lessee shall provide such ventilation within twenty days after the service upon him of such order, and in case of failure shall forfeit to the people of the state $10 for each day after the expiration of such twenty days, to be recovered by the commissioner of labor.

UNSATISFACTORY FEATURES OF ITS OPERATION

The objection to this law, which has become widespread, especially among factory owners and landlords in New York City, is that the amount of ventilation required to comply with the provisions of the law, rests entirely with the commissioner of labor, so that the rulings of one incumbent of that office might not be concurred in by his successor. The unsatisfactory features of the law have been generally recognized.

From this point the story of the movements leading up to the present condition of affairs is best told in the statements of the heating engineers' New York State legislation committee:

The American Society of Heating and Ventilating Engineers at its last annual meeting directed the appointment of a special committee to promote the passage of a bill by the legislature of the state of New York to remedy defects believed to exist in the present factory ventilation law. The appointed committee immediately conferred with the state commissioner of labor and learned that he proposed to introduce such a bill into the legislature. The co-operation of the committee was offered and welcomed. The value of such co-operation is apparent. We were then and later positively assured by both Commissioner Williams and Factory Inspector Walling that before the bill was introduced the committee would be given ample time to consider and confer with the department on the bill. Repeatedly the assurance was given that the co-operation of the committee was welcomed, their advice desired, and that ample time would be allowed for this.

The bill was introduced by the request of the commissioner on Monday, April 11, the committee heard of it indirectly on Wednesday, the 13th, the commissioner was written the same day, but up to date the committee has had no explanation of the rejection of its proffered aid to the commissioner.

PROVISIONS OF THE COMMISSIONER'S BILL

The commissioner's bill was introduced by Senator Davis, in the Senate as bill No. 1008, and was referred to the committee on the judiciary. It aims to amend Section 86 of the present factory law, and in brief provides that proper ventilation shall be deemed to have been provided in a factory workroom when the air therein shall not contain more than 10 parts of carbon dioxide in 10,000 volumes of air between 9 a. m. and 4 p. m. and 15 parts at other times, and that the temperature must be between 55° and 90° F. The remaining features of the bill are largely administrative.

Careful consideration was given by the committee to this bill, and other engineers were conferred with. A conference with the commissioner of labor was held on Friday morning, April 15, and the method of fixing the standard of ventilation was carefully considered. Certain suggestions were offered by the committee, but we were met by the commissioner's statement that he would consider no modifications of the bill as introduced; that it was his bill and he must stand by it.

STANDARD PROPOSED BY COMMITTEE

This bill not being satisfactory to the committee and other members of the society consulted, the committee for rea-

sons given below had to consider either introducing an opposition bill or securing satisfactory amendments to the present bill. The committee rules that all factories having less than 1,000 cu. ft. of air space for each occupant and each foot of gas burned per hour shall be required to provide means of ventilation to the extent of 1,000 cu. ft. of air per hour, but that factories having over 1,000 cu. ft. of space per occupant and foot of gas burned and exposed window and door area equal to one-eighth of the floor area shall not be required to provide artificial means of ventilation.

The essential difference therefore lies in the method of determining the standard of ventilation to be required. That proposed by the commissioner's bill is regarded as an innovation without warrant and open to multitudinous objections, one that will result in untold confusion and uncertainty to property owners, tenants, engineers, manufacturers, contractors, and to the department entrusted with its enforcement. It is entirely contrary to the practice of every other state having a ventilation law and to practice abroad, also to the practice of this state in its school law. It involves a method of testing familiar to very few, even among engineers, it requires an expensive instrument, the reliability of which is seriously questioned, the test itself is a very delicate operation and one easily disarranged. Only experienced operators can obtain correct results.

Carbon dioxide is not a poison, but is usually an indication of the quality of the air; in exceptional cases it may much exceed the proportion of the air specified and still the air may be good, or by artificial means the proportions of the carbon dioxide may be lessened and the air may still be bad.

The bill does not specify how many samples of the air shall be taken or where in the factory such tests shall be made. A little carelessness on the part of the person testing will condemn a factory improperly. It makes possible the acceptance or approval of methods of ventilation which are dependent wholly upon weather conditions, the tests of which will result in their acceptance or rejection according to weather conditions. Thus an advantage is given to the manufacturer of questionable ventilators and to irresponsible ventilating contractors who will take the greatest risk, and the reliable contractor whose system will ventilate regardless of weather conditions stands no chance in bidding in competition.

It makes fraud and injustice easily possible, the means for detecting which are not readily available to the owner or contractor. It may be made to do serious injustice to the property owner.

It has been intimated that the committee and the society is animated by a desire to increase the sale of mechanical ventilating apparatus. Such an insinuation is unfounded and uncalled for. With the bill as proposed or amended, the same amount of ventilating apparatus will be required. The committee is charged with the duty of, if possible, securing the passage of proper law, and no member of the society, the committee or the engineering profession will profit in one way or another, whatever may be the law. A proper and enforceable law is urgently needed. The condition of many of the factory lofts is lamentable. Nothing would do more to bring success to the anti-tuberculosis fight. Nothing would do more for the uplift of the laboring people. But the law should be simple, explicit and workable.

The specific objections to the bill as proposed by Commissioner of Labor John Williams are summed up in the following specifications:

1. Bill 1008 makes ventilating equipments possible which must sooner or later be condemned.

The state virtually says to the factory owners: Provide a ventilating equipment, and thereafter we will test the conditions of the air which it establishes in your factory. If less than 10 parts carbon dioxide are observed we will approve the installation and consider the factory well ventilated; if more, we will not do so.

On the particular day of the test, therefore, the ventilating equipment must make good.

Devices intended to overcome the shortcomings and disadvantages of open windows are placed below the raised lower and above the lowered upper sash. Through openings in them air is supposed, and on a windy day actually does, enter and leave the room; also when the weather is extremely cold outside, there is a moderate although greatly reduced flow of air out of the top opening and in through the bottom one, but on a moderately quiet and only fairly cold day such a device becomes entirely inoperative. Where, therefore, shall the occupants of the loft or factory get their fresh air?

Suppose the equipment to be complete. The inspector goes to the building with his testing instrument. If a high wind is blowing outside, or it is very cold, causing a considerable flow of air, the test shows the proper degree of purity in the loft, and the approval to which the owner is entitled under the law is given; he pays for the equipment and considers the incident closed. Sometime later the state makes another test (for Bill 1008 requires that the proper degree of ventilation must be continually maintained). At this time the wind and weather conditions are not as they were before. The "ventilators" are inoperative and the test shows twice the amount of impurity al-

lowable under the law. Result: Condemnation of the equipment, the owner's investment is wasted, and he must finally provide some form of equipment which will be efficient in all conditions of wind and weather.

Ventilation means fresh air supplied in unvarying quantities, all the time, regardless of weather, wind or temperature. Should not the basis for acceptance or approval therefore be the cubic foot of air?

2. Bill 1008 involves factory owner in needless expense.

If the above analysis is correct it makes inevitable the condemnation and removal of ventilating equipments purchased and paid for, the results of which have under certain weather or temperature conditions satisfied the legal requirements. In such case the providing of an equipment of a positive nature to replace the other involves, of course, additional expense.

3. Bill 1008 opens the way to fraud and graft.

Suppose that for reasons of economy an owner served with an order to ventilate a factory put in an equipment of window devices which ventilate only under certain wind and weather conditions. The eye of the chief inspector cannot reach to every such installation, and one of the many deputies is sent to test the air conditions established. His records may show the legal degree of air purity, although he may well know that a test on the next day might show results which would doubly condemn the ventilating equipment. It is conceivable, therefore, that under these conditions the prime qualifications of a not too scrupulous tenant would be to his desire to have selected for testing a favorable series of days and weather conditions.

4. Bill 1008 subjects factory worker to unhealthful conditions.

Its standard of approval makes possible on the part of the state inspector the approval of conditions established by ventilators which ventilate only under certain weather conditions. What of other times?

5. Bill 1008 nullifies efforts of tuberculosis campaign.

Pure air means health, the lack of it the spread of disease, particularly tuberculosis. This society insists that no law be placed upon the statute books except it provide for and insure the furnishing of an ample amount of pure air at all times.

6. Bill 1008 recommends a new, untried basis, differing from that in any other state law.

This society has before it copies of every ventilating law now in force in this country. They are all based on the measurement of cubic foot of air introduced into the breathing space. Should this state entirely depart from the practice which has proved thoroughly reliable and satisfactory in others, especially when that basis has been and is disapproved by all the engineers experienced in the art?

7. Bill 1008 provides a basis differing from that of the New York state school of ventilation law.

This law reads: "No such plan shall be approved by him [the commissioner of education] unless provision is made therein for assuring at least thirty cubic feet of pure air, per minute, per pupil, and the provision for exhausting the foul or vitiating air shall be positive and independent of atmospheric changes."

AMENDMENT PROPOSED BY THE SOCIETY

The American Society of Heating and Ventilating Engineers offers the following substitute for the method of test and standard of ventilation provided in Bill 1008:

Instead of approving a factory in respect to its ventilating equipment by measuring the amount of carbon dioxide present, let the standard be the constant and unvarying introduction of 1,000 cu. ft. of pure air, per hour, per occupant, and 500 cu. ft. of pure air per cubic foot of gas burned per hour. Let it also be required that the air shall be introduced without causing injurious drafts and without unduly lowering the temperature.

Determining the number of occupants is specified in the bill; the gas consumption can be obtained from the meter. The required amount of air is thus a matter of simple calculation, and the fulfillment or non-fulfillment of the air volume requirements is then conveniently measured by an air meter, a simple device which measures the velocity of air issuing through the ventilating openings. The determination of the proper size of the ventilating equipment is made certain for the contractor by the stipulation of the definite number of cubic feet and thus there is a minimum chance of annoyance to both owner and contractor through disapproval of equipment.

The supply of 1,000 cu. ft. of air per hour per person is the minimum amount which will maintain the purity to 10 parts carbon dioxide in 10,000 parts of air, and 500 cu. ft. of air per hour per cubic foot of gas burned per hour is the minimum amount which will maintain the purity to 15 parts carbon dioxide in 10,000 parts of air, and the standard is proposed as the only really practical standard, in being easy of measurement and in having proved acceptable for years to all identified with ventilation.

It is therefore urged that Bill 1008 be amended by striking out the parts in italics on lines 8 to 22, inclusive, on page 2, and the words "parts of carbon dioxide in 10,000 volumes of air," in line 23 on page 2 of the bill, and substituting therefor the following: All rooms or

apartments of a factory having less than 1,000 cu. ft. of air space for each and every occupant and less than 500 cu. ft. of air space for every cubic foot of gas burned per hour, shall be provided with means of ventilation supplying constantly at least 1,000 cu. ft of fresh air per hour for each and every occupant and at least 500 cu. ft. of fresh air per hour for every cubic foot of gas burned per hour. All rooms or apartments having 1,000 cu. ft. or more of air space for each and every occupant and 500 cu. ft. or more of air space for every cubic foot of gas burned per hour shall not be required to have artificial means of ventilation, provided the area of the exposed windows and doors is equal to one-eighth of the floor area of such rooms or apartments. Ventilation as hereinbefore prescribed shall be provided without causing injurious drafts and without unduly lowering the temperature in the workroom.

The two statements are signed by the full committee on New York State legislation, consisting of D. D. Kimball, New York, chairman; C. B. J. Snyder, W. M. Mackay, W. W. Macon, R. C. Carpenter and Frank K. Chew.

Current Heating and Ventilating Literature

Under this heading is published each month an index of the important articles on the subject of heating and ventilation that have appeared in the columns of our contemporaries. Copies of any of the journals containing the articles mentioned may be obtained from THE HEATING AND VENTILATING MAGAZINE *on receipt of the stated price.*

CENTRAL HEATING STATIONS

Merchants Heat and Light Company. Illustrated description of the application of the steam turbine for lighting and exhaust steam heating at Indianapolis, Ind. 1,500 w. Elec Wld—March 17, 1910. 20c.

New Power Plant of the Merchants Heat and Light Company, Indianapolis. Illustrated description of a modern central station. 3,000 w. Elec Rev, N Y—March 5, 1910. 20c.

MECHANICAL PLANTS

Heating and Ventilating the Morgan Memorial Building, Hartford, Conn. Putnam A. Bates. Brief illustrated description of this beautiful art building, with detailed description of the mechanical arrangements for heating and ventilation. 4,000 w. Eng Rec—March 26, 1910. 20c.

OZONE

The Uses of Ozone: The Ozonair System. Illustrates and describes the portable ozone generators and the system developed by E. L. Joseph. 1,000 w. Elec Rev, Lond —March 18, 1910. 40c.

Werter C. Higgins

1837-1910

The late W. C. Higgins, who died April 21, was one of the most prominent men engaged in the heating industry as a manufacturer during the past thirty years. As manager and treasurer of the Richmond Stove Company for over twenty years, he invented many improvements in the construction of warm air furnaces, stoves and ranges, and also invented and produced a complete line of round and sectional steam and water boilers.

Later, as manager of construction of the Magee Furnace Company, he brought out in approximately a year's time a complete line of round and square steam and water boilers.

Mr. Higgins was a man of great ability. He possessed an analytical mind, and was without a peer in his knowledge and comprehension not only of manufacturing, but also of the commercial side of the house-heating boiler business.

"Good enough" was a phrase not known to him. His ideals and standards were of the highest order, and his aim and ambition were not only to produce goods of the highest grade, but his keen sense of square dealing made him very anxious to give the best value to his customers.

He was intolerant of untruthfulness, dishonesty or pretension, but was very considerate, generous and loyal to all who possessed his confidence and trust. Many of the trade who knew him, as well as those who were associated with him in business, will never forget his earnestness and sincerity in seeking to promote and elevate business methods to a higher level.

The good that he achieved as an educator and as a pioneer in his chosen line of industry can hardly be overrated. The lessons he taught and the impressions he made upon the minds of those who came into personal contact with him will continue to have their influence far into the future.

Presto Steam and Hot Water Boilers are a new line of heaters that has been recently placed upon the market by the Pressed Radiator Company of America, Pittsburg, Pa. In the sectional types, the fire travel is upward between the overhanging heating surface of each section. This overhanging surface is provided with an opening on either side of each section. These openings are so arranged with baffle plates as to form a flue through which the fire travels to the rear of the boiler, then traveling upwards enters the outer row of flues on each side of the boiler.

This course brings the heated gases to the front of the boiler, then back through the center rows of flues to the smoke outlet.

These boilers are built in sizes ranging from 350 to 4200 sq. ft. of direct steam radiation capacity and from 600 to 7000 sq. ft. of hot water radiation.

NEW DEVICES

A Portable Sirocco Electric Fan and Air Purifier

Sirocco Electric Fan and Air Purifier is a device developed by the American Blower Company, Detroit, Mich., and Troy, N. Y., using a "Sirocco" (trade mark) standard, turbine type, impeller wheel but 3 in. in diameter as the basis for bringing the fan system of ventilation within the reach of everyone using electric current. The small space occupied and the light weight combine to make the "Sirocco" device portable and attractive.

On account of the high efficiency of the "Sirocco" fan, the electric motor is small (one-seventieth of a horse power) and the electric current requirement is almost insignificant. The complete outfit can be installed upon the window sill by the office boy or stenographer, without tools.

"Sirocco" will supply 5,000 cu. ft. of fresh, filtered air every hour, diffusing same throughout the room or in any direction at will, or deflected through radiator for winter ventilation. By the simple reversal of a small lever without changing the position of the outfit or stopping same, "Sirocco" will exhaust from the room the dead "used-up" air in the same large volume.

PORTABLE SIROCCO FAN AND AIR PURIFIER ARRANGED TO DELIVER FRESH AIR OVER RADIATOR

The design has been perfected and patents applied for and manufacturing facilities hurried into shape for the production of these remarkable units by the thousands. The complete outfit consists, in addition to the "Sirocco" fan, motor and reversing mechanism, of an adjustable outlet nozzle for summer use, speed controller, a dozen filter cloths, a window sash lock which prevents the window being raised from the exterior after the outfit is in place, and a rustless steel window filler adjustable to standard width sashes. Among the features of this outfit that are being emphasized is that it is not merely a centrifugal fan and motor, but an equalizer which will produce precisely those atmospheric conditions necessary for alert mental and physical activity. The air supply is purer than the outer air because of its being filtered.

ARRANGEMENT IN DETAIL OF PORTABLE SIROCCO ELECTRIC FAN AND AIR PURIFIER

This is but one of the latest applications of the famous "Sirocco" turbine fans, which are now being applied for the ventilation of kitchens, telephone booths, laundries, and toilets on land, shipboard and on wheels.

A New Electric Wire Conduit

J-M Fiber Conduit, a new cable conduit recently placed on the market by the H. W. Johns-Manville Co., New York, is made of indurated fiber, a material which has been used very extensively for insulating purposes, such as third-rail coverings, controller linings, battery boxes, etc. Water pails, etc., have also been made of it for many years.

In making the J-M fiber conduit the fiber is moulded into shape under high temperature and immense pressure, and is entirely without grain or laminations. This process gives each length of conduit a solid, 3/8-in. one-piece wall—homogeneous—with tensile strength that is remarkable when compared with the light weight of the conduit.

But the most interesting feature of this new conduit lies in the bell joints shown herewith. One end of each section is moulded to an enlarged size—belled out—with an opening as large as the outside diameter of the opposite end of the next section. Thus any two sections fit together without any reduction in the wall thickness of either section at the joint.

This makes a stronger and more rigid connection than is possible with any other kind of joint.

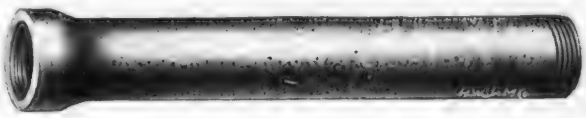
In laminated fiber conduit half the wall thickness at the ends of each length must be cut away in order that one length may fit or screw into the other. And that reduces the strength of the joint by half.

Realizing, however, that installation methods on some systems have been devised which necessitate the use of straight joints, the manufacturers have also arranged to make this new conduit with straight line joints, as shown below.

The joints in this new conduit are perfectly smooth inside. They are machine moulded and are perfectly true with no offset. Each length of the conduit is also smooth throughout its bore. This greatly facilitates the work of inserting cables.

The manufacturers claim that by reason of there being no seams or roughness at the joints of this conduit and as the air-tight joints prevent particles of concrete from seeping through, a No. 6 wire can be pushed through each duct from manhole to manhole, doing away with the ropes and rods so necessary with ordinary conduits.

Moreover, the smooth, tight joints and the smooth bore of this conduit should add greatly to the life of cable, for the seams or raw edges at joints, burns, blisters, lumps, etc., are ordinarily the greatest cause of cable trouble, as they injure or abrade the lead casing of cable when it is being drawn through the duct.



NEW CABLE CONDUIT MADE OF J.-M. FIBRE

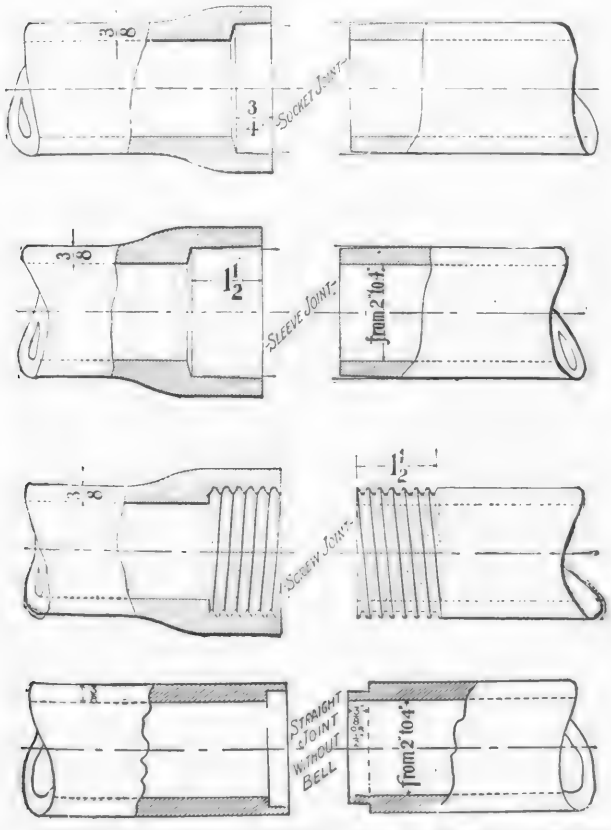
Tests made of this conduit with ⅜-in. thickness of wall show that it has an average puncture voltage of 40,800 dry and 33,000 volts after 40 hours immersion in water. Danger of electrolysis should therefore be practically eliminated by the use of this conduit.

In weight this conduit has an advantage over those made of stoneware, etc., as it weighs only about one-sixth as much. This makes it easier to handle.

The light weight also cuts down the freight charges, which is especially noticeable when laying at a considerable distance from the railroad unloading point or from storage point. Breakage is also reduced to a minimum with this conduit by reason of the great tensile strength of its walls.

A variety of fittings, such as bends, elbows, tees, etc., provide for bends and curves in the trenches. Two, three and four-way junction boxes provide for branch and service connections.

A very attractive booklet has been gotten out by the manufacturers, and a copy can, no doubt, be obtained by writing to the H. W. Johns-Manville Co., New York.



VARIOUS CONSTRUCTIONS OF J.-M. FIBRE CONDUIT

Bi-cal-ky Fan Roof Ventilators, made by the Bicalky Fan Co., 866 Prospect Ave., Buffalo, N. Y., marks an advance step in the development of this type of

apparatus, the ventilator being so built that it acts from gravity in still air and develops increased positive action when a wind is blowing. A fan is located in the front of the discharge opening which is made to revolve rapidly by the action of the wind driving through the blades on the periphery. A cowl at the top of the ventilator keeps the opposite end facing the wind currents. A cone point at this entrance is designed to compress the air entering the ventilator, resulting in a rapid movement of air through the ventilator. The wheel of the fan is remarkably sensitive, operating freely with the slightest movement of air. In an experiment made by a representative of THE HEATING AND VENTILATING MAGAZINE a slight blowing of the breath at the cone side of the ventilator served to rotate the wheel.

TEST OF 24-IN. BI-CAL-KY FAN ROOF VENTILATOR

In a recent test made with this type of ventilator, a 24-in. ventilator was used. The pipe was carried up 30 ft. from the top of the building, so that the ventilator had to perform its functions in spite of the large cooling surface offered and the consequent liability of down currents. A fire was started in a tinner's fire pot, after which coal tar and bituminous coal were used to develop a strong smoke. The outside temperature was 14°F. and the wind was blowing at the rate of 12 to 15 miles per hour. The smoke from the tinner's pot was admitted to the stack where it was successfully carried up and discharged by the ventilator. Provision for the contingency of absolutely still air is made in the construction of the ventilator through a clearance space of 1 in. which is provided at the point where the wheel is set in the ventilator. Care is also taken to secure sufficient free area, the 24-in. type, for instance, having a diameter at the discharge periphery of the wheel of 32 in. diameter. This gives a free area of about 20 per cent. in excess of the area of a 24-in. pipe. Under ordinary conditions of wind, the ventilator has been found to give almost as good results as a motor-driven fan, while with still air the results secured are similar to those obtained with other types of ventilators having no fans.

Diatomite, a new pipe and boiler covering, has been recently introduced to the trade by the New York Diatomite Co., 249 Willoughby St., Brooklyn, N. Y. Although this material is new to Americans, it has long been used in Europe under the name of Kieselguhr and is at present the standard steam insulation of the German, British, Russian and Holland navies. Diatomite consists of microscopically minute formations of practically pure silica, made up chiefly of innumerable skeletons of diatoms, containing numberless air cells and, when viewed under a powerful microscope, exhibits the most varied and remarkable shapes, such as boxes, wheels, ladders, shells, etc. Scientists have found that there are millions of these little hollow bodies to the cubic inch, which would account for its insulating properties. A recent comparative test of this material was made by William J. Baldwin, of New York, in connection with two samples of 85 per cent. magnesia covering. In each test 1½-in. pipe was used. The pipes were made of such lengths that the outer pipe surfaces were exactly 10 sq. ft. In each case the covering was 1 in. in thickness and the pipe coverings were placed upon the pipes in the usual manner. Every precaution was taken to procure dry steam (saturated) at 50 lbs. pressure and the various materials tested were transposed so as to detect difference due to location. The water of condensation was weighed at half-hour intervals and no run was made for less than a 1½-hr. period.

The experiments were made in a large room that was kept at a nearly constant temperature. The figures of one of the tests, which are typical, are given herewith:

Kind of Covering	Efficiency of Covering Per Cent	Weight per Lineal Foot, Oz.	Crushing Strength of Covering, Pounds per 4-in. Lineal Piece
Sample No. 1—			
85% Magnesia	100.	20.42	47.
Sample No. 2—			
85% Magnesia	107.5	19.74	45.
Sample No. 3—			
85% Diatomite	112.9	18.75	75.

TRADE AND MISCELLANEOUS NOTES

Coming Events

May 31-June 6, 1910.—Spring meeting of the American Society of Mechanical Engineers at Atlantic City, N. J. Headquarters at the Marlborough-Blenheim Hotel.

June 1-3, 1910.—Engineers' Society of Pennsylvania, Harrisburg, Pa.

June 1-3, 1910.—Second annual convention of the National District Heating Association at Toledo, O. Headquarters at the Hotel Boody.

June 13-16, 1910.—Twenty-second annual convention of the National Association of Master Steam and Hot Water Fitters at Atlantic City, N. J. Headquarters at the St. Charles Hotel.

June 20-July 6, 1910.—Industrial Exposition at Detroit, Mich.

June 28-30, 1910.—Twenty-eighth annual convention of the National Association of Master Plumbers at Chicago. Headquarters at the Congress Hotel.

July 26-29, 1910.—Joint meeting of the Institution (British) of Mechanical Engineers and the American Society of Mechanical Engineers at Birmingham and London, England.

June 30-July 1, 1910.—Semi-annual (mid-summer) meeting of The American Society of Heating and Ventilating Engineers at St. Louis. Headquarters at the American Hotel.

Deaths

James F. Ryan, president of the Byrne & Ryan Plumbing Co., Chicago, died at his home in Chicago, March 26. He was 50 years old. Mr. Ryan was also vice-president of the Kokomo Brass Works, the Byrne-Kingston Co. and the Kokomo Electric Co., Kokomo, Ind.

Charles Nelson, one of the pioneers in the manufacture of valves and fittings in New York City, died March 30 at Nyack, N. Y.

Walter C. Kerr, president of Westinghouse, Church, Kerr & Co., New York, died May 8, at Rochester, Minn., from

ENGINEERS AND STEAMFITTERS REQUIRE GOOD TOOLS

The GENUINE ARMSTRONG Stocks and Dies are

RELIABLE, ACCURATE, EASY WORKING

MANUFACTURED BY

THE ARMSTRONG MFG. CO., 321 Knowlton St., BRIDGEPORT, CONN

ROBERT A. KEASBEY CO.

HEAT AND COLD INSULATING MATERIALS

85% Magnesia and Asbestos Pipe and Boiler Coverings

CORK COVERINGS FOR BRINE PIPES, ETC.

ESTIMATES FURNISHED AND CONTRACTS EXECUTED

"RAKCO" BRAND ASBESTOS, FLAX AND RUBBER PACKINGS

For all classes of Marine and Stationary Engines and Pumps

100 North Moore Street NEW YORK CITY

Telephone, 6097 Franklin

cancer. He was 52 years old. Mr. Kerr was eminent in his profession and was a member of the American Institute of Electrical Engineers, the Canadian Society of Civil Engineers, the American Society of Mechanical Engineers and the Franklin Institute. He designed and constructed the Union Depot in Boston. His firm is now putting in the electrical equipment of the Pennsylvania terminal and the Long Island Railroad, New York.

Miscellaneous Notes

Claude A. Bulkeley, formerly chief engineer for the Board of Education, St. Louis, Mo., has become associated with Marks & Woodwell, New York.

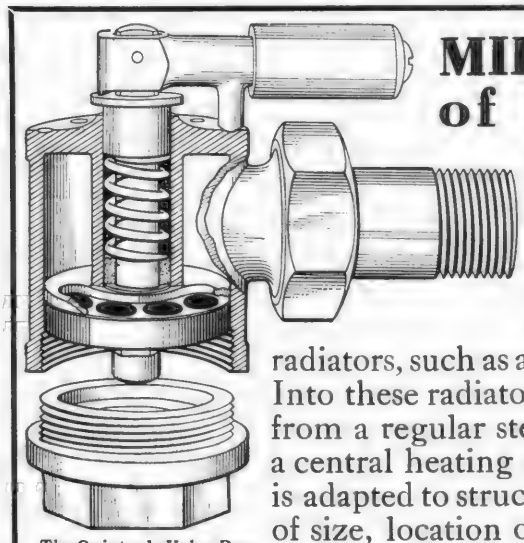
United Bunch of Sheep, a western organization of salesmen in the heating and plumbing supply business formed about two years ago, has established a New York fold, to be known as New York Fold No. 3. The initiation ceremonies were conducted by Walter S. Rait, of Chicago, Supreme Shearer of the Supreme Fold. The organization was effected by the election of the following officers: Grand Ram, Thomas H. Hutchinson; Vice-Ram, O. Chan Wells; Past Grand Ram, E. C. Molby; Shepherd, A. H. White; Shearer, J. W. Gannon; Keeper of the Golden Fleece, Henry Stein; Directors (one year), Donald L. Stevens; (two years) Robert G. Williams; (three years) J. S. Mattimore.

Modern Science Club, Brooklyn, N. Y., at its meeting April 19, had as its principal speaker F. L. Johnson, associate editor of *Power*, who delivered a lecture on short cuts and easy methods of figuring, entitled "Thumb Rules and Guess Work."

Engineers' Society of Western Pennsylvania, Pittsburg, Pa., announces the removal of its quarters to the Oliver Building, Sixth avenue and Smithfield street.

Minneapolis, Minn.—According to a ruling of Attorney-General George T. Simpson, the regents of the university have sole authority in erecting the proposed new heating plant for that institution. Under the state laws the board of control has the supervision of all buildings for the state, no matter for what purpose. The law appropriating $150,000 for the heating plant at the university says nothing, however, about a building, and the ruling is made on that ground.

Eugene Heating & Power Co., Eugene, Ore., has been formed by Mayor J. D. Matlock, S. H. Friendly and Eli Bangs to build a central heating plant in the business district of the city to furnish heat for a large number of business blocks. It is expected to have the plant in operation this fall.

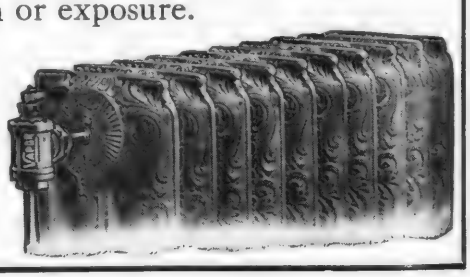


The Quintuple Valve Regulates the Temperature of the Radiator

MILLIONS of FEET of RADIATION

Are now operating on the **Broomell Patented Vapor Heating System** with universal satisfaction.

Broomell's Vapor System distributes heat by means of radiators, such as are used on hot water systems. Into these radiators vapor is conveyed by pipes from a regular steam boiler or heater or from a central heating station. The Vapor System is adapted to structures of every class regardless of size, location or exposure.



Send for our 64-Page Catalogue

Vapor Heating Company

Broomell's Patent Vapor System

525 North American Building
Philadelphia

New York
1123 Broadway

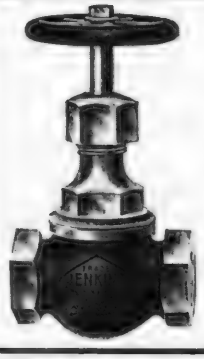
Boston
79 Milk Street

United States Light & Heating Co., Niagara Falls, N. Y., capitalized at $17,500,000, a Maine corporation, has broken ground at Niagara Falls for a plant that will give employment to about 2,000 men. The company will manufacture storage batteries and appliances for lighting and heating railway cars. The plant is being heated and ventilated by the Harrison Engineering Co., New York, through a unique system described in another item.

National Association of Jobbers of Plumbing Supplies is a new organization which was formed at Niagara Falls, N. Y., April 25 and 26 last. The organization is the result of a call issued by a committee of supply men and sent out by Thomas A. Fernley, Philadelphia, secretary of the National Association of Jobbers of Wrought Pipe and Fittings. The meeting was presided over by Clarence V. Kellogg, chairman of the committee having the matter in charge, and after an extended discussion of the advantages to be derived from organizing, the organization was effected by the election of the following officers: President, Clarence V. Kellogg, Chicago; first vice-president, Frank A. Bucknam, New York; second vice-president, H. W. Thorndike, Boston; treasurer, J. Harvey Borton, Philadelphia. Executive committee: William Schlipp, Jr., Baltimore; J. L. Sullwold, St. Paul; A. B. Pierce, St. Louis; George H. Bailey, Pittsburg; Charles W. Frean, New York, and L. S. Merkel, Cincinnati. Thomas A. Fernley was elected secretary and the headquarters of the association for the present will be at 505 Commerce street, Philadelphia.

National Association of Jobbers of Wrought Pipe and Fittings has issued a pamphlet on the subject of "Price Maintenance," which treats particularly of the matter of resale prices of manufacturers. The pamphlet is being sent out by the secretary, T. A. Fernley, 505 Commerce street, Philadelphia.

Central Supply Association and Eastern Supply Association will hold a joint meeting at the Hotel Secor, Toledo, O., Tuesday and Wednesday, June 14 and 15.



JENKINS BROS. VALVES

are the original and only genuine "Jenkins" valves. They are the easiest to keep tight. They are strong, well designed, carefully constructed, and nicely finished. Don't take an *imitation* "Jenkins"—insist on having the kind which bear our trade mark, as shown in the cut, and you are guaranteed satisfaction.

We shall be glad to send catalog on request.

JENKINS BROS.

NEW YORK BOSTON PHILADELPHIA CHICAGO

TABLES FOR VENTILATING DUCTS

By C. E. PEARCE, M. E.

A set of six tables printed on heavy bristol board. Size 7 x 9 inches. Wire hanger attached. Handy for shop or drafting room.

These tables are simple and practical, and present the best short-cut method for figuring sizes of Ventilating Ducts.

Price, postpaid, 50c.

Address **Heating and Ventilating Magazine,** 1123 Broadway, New York

You are invited to VISIT our

DEMONSTRATION PLANT

which illustrates the most advanced ideas as applied to **Heating Systems,** especially in connection with Central Generation and Distribution of **Fuel Gas, Electric Current** and **Heat**

In this plant over 80 per cent. of the lower cost heat units is applied in work

Write for appointment for visit

TORRIDOOR POWER, LIGHT & HEATING CO.

94 Prospect Street - - - - - EAST ORANGE, N. J.

Federal Furnace League held its annual meeting at the Hotel Astor, New York, May 10 last.

Building operations during March, 1910, from 49 cities show a gain of about 3% over those for the corresponding period last year. In the eastern cities the decrease was 4%; middle west, increase of 23½%; southern, increase of 25%; Pacific coast, decrease of 13½%.

University of Wisconsin, Madison, Wis., announces the tenth annual session of the Summer Schools for Engineers and Artisans, under direction of the College of Engineering. The sessions will begin June 27, continuing for six weeks. Advanced courses are offered in direct and alternating currents, hydraulics, machine design, descriptive geometry, applied mechanics, shopwork, steam and gas engineering and surveying. Elementary courses for artisans and those not having preparation for the advanced work are also offered. The teaching staff is taken from the regular instructional force, and all laboratory equipment of the engineering college is available for students. Bulletin or further information may be obtained from F. E. Turneaure, Dean, College of Engineering, Madison, Wis.

Manufacturers' Notes

Gurney Heater Mfg. Co., Boston, Mass., has made arrangements to remove its plant to South Framingham, Mass. Its present plant is located at East Boston. Plans for the new factory buildings are ready, and it is expected that the change will be made within a year. The main building, which will be L-shaped, will have a total frontage of 1,500 ft., and the plant will cost approximately $250,000 to build. The company is one of the old-established and well-known manufacturers of steam and hot water boilers, radiators and ranges, and employs about 400 men. A Canadian Gurney company has plants at Toronto and Hamilton, Ont, Canada.

Gurney Heater Mfg. Co., Boston, Mass., announces the appointment of Richard B. Hunt as manager of its New York office.

George E. Rinkenberger, formerly manager of the New York office of the Gurney Heater Mfg. Co., Boston, has become associated with George P. Morell & Co., heating contractors, Bronx, New York.

Thomas Fleming, manager of the home office of the Model Heater Heating Co., Philadelphia, has resigned.

DIXON'S PIPE JOINT COMPOUND
Is Steam Proof and Gas Proof
It is adopted as official standard by railroads, gas companies, and radiator makers. Write for free samples
JOSEPH DIXON CRUCIBLE CO. Jersey City, N. J.

"THE POTTER" MESH SEPARATOR
OR BOILER DRY-PIPE
DRY STEAM—SAFETY—ECONOMY
POTTER SEPARATOR CO., Newburgh, N.Y. N.Y. OFFICE: 39 Cortlandt St.

H. W. JOHNS-MANVILLE CO.
ASBESTOS AND MAGNESIA COVERINGS, ROOFINGS, PACKINGS, FIRE-PROOF AND COLD STORAGE INSTALLATION, ELECTRICAL AND PLUMBERS' SUPPLIES, ETC.
SEND FOR CATALOG — OFFICE AND WAREHOUSE IN EVERY LARGE CITY.

Hart & Crouse Co., Utica, N. Y., announces the appointment of Walter S. Appleton as manager of its New York office which has been opened in the Flatiron Building. Mr. Appleton was for many years New York manager for the United States Radiator Co., of Dunkirk, N. Y.

Pressed Radiator Co. of America, Pittsburg, Pa., announces its entrance into the boiler field. The company has placed on the market a full line of steam and hot water boilers, including vertical, round and sectional types, as well as laundry and tank heaters. The new line will bear the name of Presto.

Union Light, Heat & Power Co., Fargo, N. D., has been sold to the H. N. Byllesby Co., of Chicago, the transfer involving about $500,000. The company has been owned by the Paul Doty interests of St. Paul up to the present.

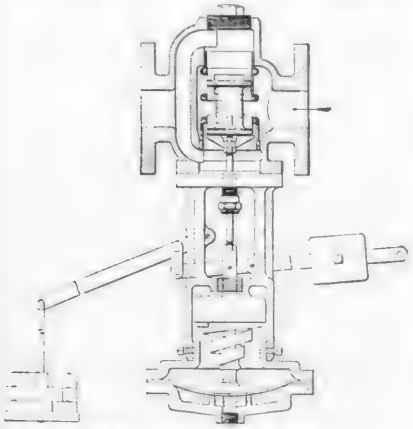
Detroit Heating & Lighting Co., Detroit, Mich., has completed the enlargement of its plant by the addition of a three-story brick building. The company will increase its force from 150 to 200 hands.

National Ventilating Co., Harrison, N. J., has sold its plant at Railroad avenue and Fifth street for about $15,000.

American Radiator Co., Chicago, has enlarged its quarters in Cincinnati, O., by

WATERS
Reducing Valves

for steam heating purposes a specialty. Also valves for vacuum heating systems.



Manufactured by

Waters Governor Co.

34 Oliver St., Boston, Mass.

The Easiest Way to Ventilate a Power House

is to use "Vacuum" ventilators. They will keep the overheated air moving outward and will materially reduce the temperature in the building by promoting a lively circulation of air.

The Power House of the Tampa Electric Co., shown above, is ventilated by two 72-in. and two 12-in. "Vacuum" ventilators.

The "Vacuum" is built upon scientific principles, the two leading features of which are the vertical outlet for hot air, and double the working surface of other styles.

Write for descriptive booklet which tells why the "Vacuum" is the most efficient and satisfactory ventilator in existence.

The Vacuum Ventilator Co.

82-86 Purchase St. Boston, Mass.

Representatives in

New York, Detroit, Pittsburgh, Cincinnati, Buffalo, Cleveland, Philadelphia, Denver

moving to the second floor of the Rawson Building, at Fourth and Elm streets, where it will have its offices and showrooms.

Abendroth Bros., Portchester, N. Y., announces the removal of its Boston branch to 294 Franklin street.

Wisconsin Engine Co., Corliss, Wis., announces the appointment of Benjamin K. Hough as its Boston sales manager. Offices will be opened in the Oliver Building.

C. J. Tagliabue, New York, manufacturer of thermometers, etc., has moved his executive offices to 396-398 Broadway, corner of Walker street.

Crane & Ordway, St. Paul, Minn., announces the appointment of L. E. Rollins, of Minneapolis, as resident manager.

J. H. McLain Co., Canton, O., at a recent meeting of directors, elected as president, George E. Downe, until recently in charge of the house heating boiler business of the American Radiator Company, Chicago. Mr. Downe was formerly associated with the late J. H. McLain in the manufacture of the Spence line of hot water heaters which were made for many years at the Canton plant. He was at that time (1888) president of the National Hot Water Heater Co. Under the new administration, the J. H. McLain Company is planning a noteworthy extension of its business, and as a step in this direction the company announces that on April 12 arrangements were consummated whereby it acquired the entire radiator plant, tools, machinery and pattern equipment of the Sodemann Heat & Power Co., of St. Louis, the plant being located at Edwardsville, Ill. The terms of sale are stated to be about $100,000. This company's well-known line of Interchange steam and hot water radiators will continue to be manufactured by the McLain Co. William Sodemann will remain with the manufacturing department and will be manager of the plant, which will be known as the St. Louis plant of the J. H. McLain Co. The Interchange line of radiators will also be manufactured at the Canton plant.

Sodemann Heat & Power Co., St. Louis, Mo., which has sold its manufacturing business to the J. H. McLain Co., Canton, O., will continue its heating and contracting business.

International Heater Co., Utica, N. Y., at its annual meeting elected the following directors for the ensuing year: H. R. Williams, W. F. Baker, C. S. Symonds, E. J. Millspaugh, J. F. Maynard, F. E. Wheeler and F. H. Moore. The following officers were elected: President, F. E. Wheeler; vice-president, H. R. Williams; secretary, E. J. Millspaugh; treasurer, F. H. Moore.

H. B. Smith Co., Westfield, Mass., has begun an extension to its North End

THE
Ventilation Laws
OF THE STATES OF
MASSACHUSETTS NEW JERSEY
NEW YORK PENNSYLVANIA
VERMONT
INCLUDING NEW YORK AND ILLINOIS
STATE FACTORY VENTILATION LAWS
Comprising all the statutes now in force in this country regulating the ventilation of school and other public buildings
BOUND IN VEST POCKET SIZE
Price, 15 Cents net, or 17 Cents, Postpaid
ADDRESS THE PUBLISHERS
Heating and Ventilating Magazine Co , 1123 Broadway, New York

plant by the erection of a building 48 x 80 ft., adjoining its foundry. A concrete core room is also being built at its South Side plant.

Crosby Steam Gage & Valve Co., Boston, Mass., announces the removal of its New York branch to 44 Dey street.

L. J. Wing Mfg. Co., New York, announces the resignation of L. J. Wing as its president. E. D. Fieux has been elected president in his place. C. E. Cole has been made vice-president, and H. S. Wheeler has been re-elected secretary. Mr. Wing will continue to be a director and stockholder of the company.

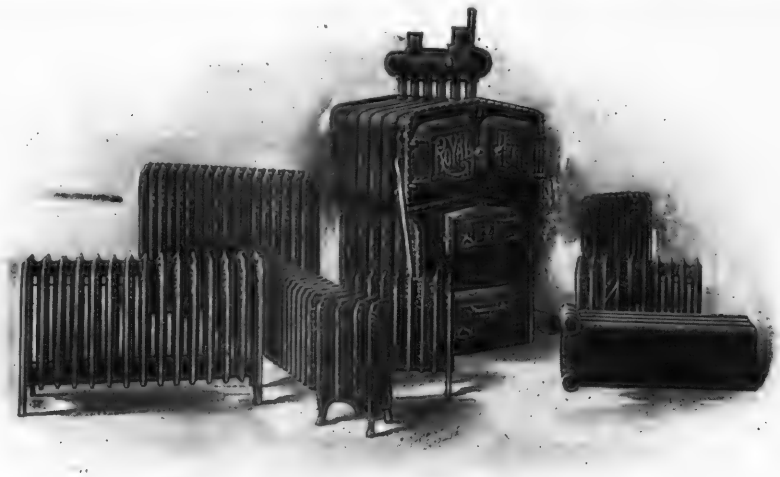
Louis Bruch, in charge of the publicity department of the American Radiator Co., Chicago, has sailed for Europe, where he will visit the foreign branch companies as well as deliver his well-known lecture on the manufacture of house heating boilers, in a number of cities.

American Blower Co., Detroit, Mich., announces the resignation of Frank McMurdie, who has been superintendent of the company's Detroit plant since 1894, and who first became an employee of the company in 1883. He has been appointed general superintendent of the Clarage Foundry & Manufacturing Co., Kalamazoo, Mich.

A. M. Byers Co., Youngstown, O., suffered a loss of $100,000 recently through the destruction by fire of its Girard plant.

G. M. Davis Regulator Co., Chicago, reports the shipment of the third 36-in. special relief valve to the Detroit Edison Co., Delray, Mich. The valve weighs 9,500 lbs. The company also reports an order for three standard 36-in. relief valves for the Commonwealth Edison Co., Chicago. Another interesting sale made by this company is a 28-in. back pressure valve for vertical pipe, to be used in connection with an open heater on which 5 lbs. back pressure is carried. This valve is for the plant of the Tennessee Coal, Iron & R. R. Co., Ensley, Ala. The big valve receives the exhaust after passing through the heater from 3,000-H.P. Corliss engines, which supply power to the machine shops of the company's steel mills.

J. H. McLain Co., Canton, O., announces that Leonard S. Downe, who has been the western representative of W. A. Russell & Co., New York, manufacturer of heating specialties, has joined the former company's staff. J. B. Crowl, formerly of the Alliance Hardware Co., Alliance, O., will represent the McLain Co. in the northwest, while Ray DeLang, late secretary to Geo. E. Downe in the office of the American Radiator Co., will



Let us send you a few copies of "Heating and Ventilating the American Home"—an article in booklet form. You can distribute these to advantage among prospective homebuilders in your town.

HART & CROUSE CO.

Home Office: Utica, N. Y.

BRANCHES:
New York, 607 Flatiron Building
Chicago, 80 Lake St.
Dallas, 659 Elm St.
Columbus, Poplar and Henry Sts.
Minneapolis, Exchange. 742 Lumber

take care of the Chicago interests of the McLain Company, with offices at 647 West Lake street.

Richard D. Reed, for many years sales manager for the H. B. Smith Co., Westfield, Mass., will shortly retire from that company and will assume the management of a large foundry that will be located probably in Springfield.

New Firms and Business Changes

Howden-Curtis Co., Grand Rapids, Mich., successor to the Grand Rapids Plumbing & Heating Co., has disposed of its plumbing business and will add a complete line of mill and factory equipment. The company will make a specialty of high-pressure work.

Chambers & Holbrook, composed of George F. Chambers and C. C. Holbrook, have opened a heating and plumbing contracting business at 1322 Broadway, Denver, Col. Mr. Chambers was formerly a member of the plumbing firm of Healy & Chambers, Watertown, N. Y.

Valley Plumbing & Supply Co. is the changed name of the Valley Plumbing & Machinery Co., Brownsville, Texas. The capital stock has been increased from $10,000 to $100,000.

Columbus Heating & Ventilating Co., Columbus, O., has sold the heating and ventilating departments of its business to a group of business men who will make use of the company's name. The new president and manager is J. C. Bowman, Holland, Mich., succeeding D. A. Ebinger. The other new officers are F. H. Field, vice-president; Charles H. LaMonte, secretary and treasurer. The sanitary branch of the business will be conducted by the retiring president, E. D. Ebinger, under the name of the E. D. Ebinger Sanitary Mfg. Co., and will occupy a new building on Locust street.

Connersville Light, Heat & Power Co., Connersville, Ind., has increased its capital stock from $10,000 to $300,000.

De Laval Steam Turbine Co., Jersey City, N. J., capital $1,500,000, has been licensed to transact business in Illinois with a state capital of $10,000.

Pacific Electric Heating Co., Ontario, Cal., capital $100,000, has been licensed to transact business in Illinois with a state capital of $10,000.

Mechanic & Kremer-Moon Heating Co., 1417 Olive street, St. Louis, Mo., is a consolidation of the Mechanic Heating & Construction Co. and Kremer-Moon Co. Robert G. Kremer is vice-president and superintendent.

Alma Heating Co., New York, heating and ventilating engineers and contractors, notice of whose incorporation was contained in our last issue, has leased

JUST OUT *Fifth Edition Revised and Enlarged*

Heating and Ventilating Buildings

A MANUAL FOR HEATING ENGINEERS AND ARCHITECTS

By ROLLA C. CARPENTER, M.S., C.E., M.M.E., LL.D.,
Professor Experimental Engineering, Cornell University

8vo, xvi + 562 pages, 277 figures. Cloth, $4.00

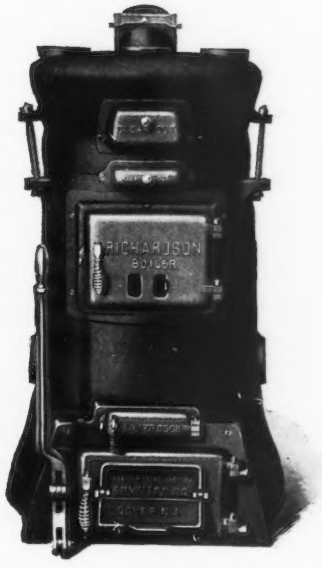
PREFACE TO THE FIFTH EDITION.—The fifth edition has been corrected and so far as possible brought up to date. The part relating to the construction and use of the blowing fan has been largely rewritten. In preparing this revised edition the author has had the assistance of M. F. Thomas, M.M.E., who has had an extensive practical experience as a heating and ventilating engineer and who has made some notable investigations of the capacity and efficiency of various forms of blowing fans.

ITHACA, N. Y., November 1, 1909.

CONTENTS.—Nature and Properties of Heat. Principles of Ventilation. Amount of Heat Required for Warming. Heat Given off from Radiating Surfaces. Pipe and Fittings Used in Steam and Hot-Water Heating. Radiators and Heating Surfaces. Steam-Heating Boilers and Hot-Water Heaters. Settings and Appliances. Methods of Operating. Various Systems of Piping. Design of Steam and Hot-Water Systems. Heating with Exhaust Steam. Non-Gravity Return Systems. Heating with Hot Air. Mechanical Ventilators. Mechanical Systems of Heating and Ventilating. Heating with Electricity. Temperature Regulators. Schoolhouse Warming and Ventilation. Specification Proposals and Business Suggestions. APPENDIX.—Literature and References. Explanations of Tables. Tables. Index.

FOR SALE BY **The Heating and Ventilating Magazine,** 1123 Broadway New York

RICHARDSON ROUND BOILERS



HOT WATER

STEAM

Powerful, Efficient, Economical

Easy to Erect, Conservatively Rated

RICHARDSON & BOYNTON CO.

MANUFACTURERS

31 WEST 31st STREET

BOSTON *NEW YORK* CHICAGO

the entire building at 113 Beekman street, adding new and improved machinery and appliances.

New Incorporations

Simplex Electric Heating Co., Newton, Mass., location in Evanston, Ill. Capital stock, $160,000; capital in Illinois, $26,400.

Bluffs Electric Light, Power & Heating Co., Bluffs, Ill. Incorporators: Fred C. Brockhouse, John D. Brockhouse and F. C. Funk.

Charles Balanced Valve Co., Atlanta, Ga., capital $30,000, to manufacture valves and other steam specialties. Incorporators: M. M. Neese, W. C. Hunter and F. C. Charles.

New Milford Foundry & Machine Co., New Milford, Conn., capital $25,000, to manufacture steam and hot water heaters. Incorporators: J. A. Northrop, V. P. Staub, E. J. Emmons, H. G. Barton, W. G. Green and W. B. Hatch.

H. F. Martin & Sons, Swanton, Vt., capital $10,000, to conduct a general heating, plumbing and hardware business.

Western Heating, Plumbing & Construction Co., Aberdeen, Wash. Capital stock, $25,000. Incorporators: C. L. Peterson, C. A. Pinckney and Curtis Mann.

Fay Sole Heat Retainer Co., Oklahoma City, Okla., capital $50,000, to manufacture heating specialties. Incorporators: W. R. Fay, C. W. Tennant, J. F. Murphy and Henry Roup.

Edwin H. Moore Co., Jersey City, N. J., capital $125,000, to conduct a heating, plumbing and gas fitting business. Incorporators: Edwin H., Robert G. and Elmer L. Moore.

E. J. McDonough Co., Chicago, incorporated to conduct a contracting business in heating and ventilating. Incorporators: George E. Gorman, Daniel L. Madden and E. J. McDonough.

Foster-Smith Plumbing Co., Norfolk, Va. Capital, $25,000. President, F. P. Smith; vice-president, S. L. Foster; secretary, J. P. Williams.

William H. Seddon Plumbing & Heating Co., Columbus, O. Capital, $40,000. Incorporators: William H. Seddon, Harley E. Burns, C. C. Williams, O. Gibson and Stockton Raymond.

Kurtzner Radiator Co., Cleveland, O., capital $10,000, to manufacture radiators for automobiles.

Grambs & Peet Co., capital $50,000, to conduct heating and plumbing establishment at Bismarck, Dickinson and Mandam, N. D., and Miles City and Glendive, Mont.

Selzer Heating Co., Akron, O. Capital stock, $20,000.

Grosvold-Bartingale Co., Eau Claire, Wis., capital $4,000, to deal in heating and plumbing supplies. Incorporators: M. Anderson, Fred E. Grosvold, Robert O. Bartingale and Clara B. Grosvold.

Contracts Awarded

Paul J. Krez & Co., Chicago, Ill., have been awarded the contract for supplying all the covering necessary in connection with the State Capitol power house and tunnel at Madison, Wis.; also the contract to install their Advance breeching lining in the Capitol power house breeching. The company has recently moved into new quarters at 56 Fifth avenue, Chicago.

Healy Plumbing Co., St. Paul, Minn., was the low bidder for the heating plants of the two new 8-room additions to the Mound Park and Baker schools at that place, as well as for the plumbing of the same buildings. The heating bids were: for the Mound School, $3,965, and for the Baker School, $3,542.

Lewis & Kitchen, Chicago, were the lowest bidders for the heating and ventilating of the new Academy annex at Elmira, at $15,986. The low bidder for the vacuum cleaning outfit was George H. Young, $1,009.68. J. & W. S. Walker put in the lowest plumbing bid at $8,095.

P. J. Gallagher, Faribault, Minn., heating and plumbing new Carver County court house at Cheska, Minn., for $5,000.

Crook-Kries Co., Baltimore, Md., heating and ventilating apparatus for the Notre Dame College in that city. The equipment will include a 250-H.P. watertube boiler. The work will cost $25,000. Architect, Thomas C. Kennedy; consulting engineer, C. L. Reeder.

Pacific Fire Extinguisher Co., San Francisco, Cal., heating and ventilating and power plant for the new Bankers Hotel at Oakland, Cal. The work will cost $30,080.

Machinery & Electrical Co., Los Angeles, Cal., heating and ventilating new manual training school, in that city, for $14,823.

Taylor & Taylor, Meriden, Conn., steam heating and plumbing for the Undercliffe Sanitorium, for about $3,200.

Massachusetts Fan Co., Watertown, Mass., are furnishing ventilating fans for the following school buildings: Bulwer, Dennison, Dean and Wade Park schools, Cleveland, Ohio; Hicksville and Oceanside schools on Long Island, and schools in New Bethlehem, Pa., Haysborough, Pa., and Salem, W. Va.

Harrison Engineering Co., New York, has received the contract from the U. S. Light & Heating Co., Niagara Falls, N. Y., for the heating and ventilating of the latter's plant at that place. The five buildings are to be heated throughout by Harrison aertube heaters. Producer gas will be burned for fuel, and the heaters will utilize the waste heat from the many lead melting furnaces. The air, of which 120,-

000 cu. ft. will be supplied per minute, will be distributed throughout the entire five buildings by special electric cone fans.

American Heating Co., Superior, Wis., hot water heating new dormitory of the Superior Normal School, for $4,500.

Martin & Wigman, Green Bay, Wis., fan blast heating system for the new addition to the academy of the Sisters of St. Joseph, at Green Bay.

Fargo Plumbing Co., Fargo, N. D., heating and plumbing Ceres Hall, at the Agricultural College, for $12,494.

Robert Dalzell, Jr., San Francisco, Cal., heating, ventilating and sterilizer systems for the Hospital for Children and Training Home for Nurses, in that city. The contract amounts to $12,497.

Spencer Heating Co., Minneapolis, Minn., heating and ventilating new Roosevelt school, for $6,660. The plumbing contract went to the Dakota Plumbing & Heating Co., at its bid of $2,358.

Downey & Kruse, Milwaukee, Wis., power house and heating system for plant of the Walworth Co., at Elkhorn, Wis.

Trent Engineering & Mfg. Co., Salt Lake City, Utah, central heating and electric light plant for the Mormon Tabernacle, the Temple, Assembly Hall, Utah Hotel and Vermont and Sharon buildings. The contract amounts to $200,000.

BOOKS ON HEATING AND VENTILATION

AT REDUCED PRICES TO NEW SUBSCRIBERS ONLY

Heating and Ventilating Buildings, a standard manual for heating engineers and architects. By Prof. R. C. Carpenter. Fifth edition, largely rewritten. 577 pages. 277 Ills., 8vo, cloth. $4.00.

Baldwin on Heating; or Steam Heating for Buildings By William J. Baldwin. Fifteenth edition. Revised and enlarged. 391 pages. 131 figures. Size, 5x7½ in. Contains descriptions of steam heating apparatus tor warming and ventilating large buildings and private houses, with remarks and tables. Cloth, $2.50.

Questions and Answers on the Practice and Theory of Steam and Hot-Water Heating. By R. M. Starbuck. Illustrated. $1.00.

The Ventilation of the Schoolroom. By William J. Baldwin. Price, $1.00.

Ventilation of Buildings. By William G. Snow and Thomas Nolan. 83 pages. Pocket size. Contains a statement of the general principles of ventilation and of their application to different kinds of buildings. Boards, 50c

Steam Heating and Ventilation. By Wm. S. Monroe. Containing formulas and data valuable in the designing of heating and ventilating plants. Price, $2.00.

Air-Conditioning. By G. B. Wilson. Being a short treatise on the humidification, ventilation, cooling and the hygiene of textile factories—especially with relation to those in the U. S. A. With figures. 12mo. Illustrated. 143 pages. Price, $1.20.

Steam-Electric Power Plants. By Frank Koester. A practical treatise on the design of Central Light and Power Stations and their economical construction and operation. 473 pages. 340 ills. Price, $5.00.

Light, Heat and Power in Buildings. By Alton D Adams, M. E. The purpose of this volume is to present in compact form the main facts on which selection of the sources of light, heat and power in buildings should be based. The problem is to determine the kind of equipment that will yield the service required at the least cost. 12mo. Cloth, $1.00.

Practical Steam and Hot Water Heating. By Alfred G. King. Containing over 300 detailed illustrations. The book is a working manual for heating contractors, journeymen steam fitters, architects and builders. Describes various systems of heating and ventilation and includes useful data and tables for estimating, installing and testing such systems. 8vo. 367 pages. Price, $3.00.

Dean's System of Greenhouse Heating, by steam or hot water, with formulas for obtaining different temperatures, by Mark Dean. Price, $2.00.

Power, Heating and Ventilation. By Charles L. Hubbard, B.S., M.E. A treatise for designing and constructing engineers and architects. The whole subject of heating is covered, including the heating of large institutions with central plants. Space is also devoted to electrical matters connected with steam plants. 647 pages. Price, $5.00 (three volumes in one).

Notes on Heating and Ventilation. By John R Allen. 152 pages. 34 illustrations. Size, 4½x6½ in. One of the new books, brought quite up to date, and containing much information to guide the intelligent steam fitter in the installation and heating and ventilating apparatus. Cloth, $2.00.

Hot-Water Heating and Fitting. By W. J. Baldwin Fourth edition. Price, $4.00.

Steam Fitters' Computation and Price Book, abridged. By Mark Dean. Price, $2.50.

Practical Treatise Upon Steam Heating. By F. Dye. Embracing methods and appliances for warming buildings, etc. Low pressure, high pressure and exhaust steam. 8vo, cloth, illustrated. Price, $4.00.

The School House. Its Heating and Ventilation. By J. A. Moore. 204 pages, illustrated. $2.00.

A Manual of Heating and Ventilation, for engineers and architects, embracing tables and formulas for dimensions of pipes for steam and hot-water boilers, flues, etc. By F. Schumann. Second edition, revised and enlarged. 12mo, $1.50.

German Formulas and Tables for Heating and Ventilating Work, especially adapted for those who plan or erect heating apparatus. By Prof. J. H. Kinealy. Illustrated. Price, $1.00.

Tables for Calculating Sizes of Steam Pipes. By Isaac Chaimovitsch. A manual for the determination of steam pipe sizes for low pressure heating. 48 pages. 4 insert tables. Price, $2.00.

Centrifugal Fans. By J. H. Kinealy. A theoretical and practical treatise on fans for moving air in large quantities at comparatively low pressures. 206 pages. 39 diagrams. Full limp leather pocketbook round corners, gilt edges. Price, $5.00.

The Principles of Heating. By William G. Snow. A practical and comprehensive treatise on Applied Theory in Heating. 161 pages. 42 illustrations. 38 tables. Size, 6x9 in. Cloth, $2.00.

An Outline of Warming and Ventilating By William J. Baldwin. Price, $1.00.

Modern Sanitary Plumbing, Steam and Hot Water. By James J. Lawler. 400 pages. 228 illustrations. Size, 6x9 in. This is the latest edition of Mr. Lawler's well-known work on this subject. Price, $5.00.

ADDRESS

The HEATING and VENTILATING MAGAZINE 1123 Broadway NEW YORK

Consolidation of Boiler and Radiator Interests.

An important merger of radiator and boiler manufacturers, which has long been under discussion, has been announced. The new company will be known as the United States Radiator Co., and will embrace the United States Radiator Co., Dunkirk, N. Y.; the United States Heater Co., Detroit, Mich.; the Herendeen Mfg. Co., Geneva, N. Y.; the United States Radiator & Boiler Co., Pittsburg, Pa., and the boiler and radiator departments of the J. L. Mott Iron Works, New York. It is reported that the president of the new concern will be Charles E. Patterson, of Dunkirk, and the vice-president, R. J. Gross, of the United States Radiator Co. Bonds are being underwritten by the First National Bank of Detroit and the Citizens' Savings & Trust Co., of Cleveland.

New York Steam Fitters' Strike, which has been on since January 1, last, has been settled, the steam fitters accepting the compromise offer of the employers. According to the settlement, the steam fitters will receive $5.00 until January 1, 1911, which are the wages paid them at the time the strike was ordered. After January 1, the matter of their receiving $5.50 on a three-year agreement will be taken up.

Howard S. Hadden, for many years a member of the firm of the Baldwin Engineering Co., New York, announces that on May 1, last, he associated himself with Henry King Hannah, 277 Broadway, New York, advertising.

Eastern Trade Golf Association has sent out announcements of its Spring Tournament which will be held on the links of the Wykagyl Country Club, New Rochelle, N. Y., Tuesday, May 24. At the recent annual meeting of this association the following officers were elected: President, C. N. Brizse; vice-president, W. G. Le Compte; secretary-treasurer, A. S. Armagnac; captain, J. Barton Garfield.

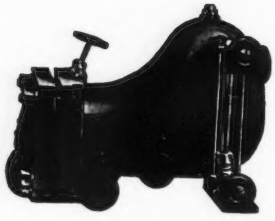
Wanted.

Wanted.—Position as heating and ventilating engineer and estimator. Have had five years' experience. Address Estimator, care of Heating and Ventilating Magazine.

Chas. E. Scott, the vapor heating man, was explaining to a prospective customer the difference between vapor and vacuum heating. "Do you understand," he said, "what a vacuum is?" The prospective customer was a bit hazy on the subject, but replied: "A vacuum? Well, a vacuum is where the Pope lives without any air."

McDaniel Improved Steam Trap

WILL DO THE WORK



When you need a Steam Trap buy one you know will work. With a McDANIEL we take all the chances. Don't pay until you are satisfied. We have been 25 years manufacturing Steam Traps and know there is no better trap made. May we send you one for trial?

Watson & McDaniel Co.

160 North 7th Street - PHILADELPHIA, PA.

Send for Catalogue

BOUND VOLUMES OF

The Heating and Ventilating Magazine

VOL. VI. FOR 1909 NOW READY

Suitably Bound in Cloth and Containing Full Cross Index

PRICE, Sent Postpaid to any Address in U. S., $2.50

ADDRESS

Heating and Ventilating Magazine, 1123 Broadway, New York